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### (54) HEAT SEALING FILM

#### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a heat sealing film having excellent impact resistance, flexibility, heat resistance, sealing strength and low bleeding-out properties, or particularly a heat sealing film made of a non-stretched film or sheet having excellent impact strength, flexibility, heat resistance and sealing strength and to provide a heat sealing film made of a stretched film or sheet exhibiting excellent heat resistance, sealing strength and low bleeding-out properties.

**SOLUTION:** The heat sealing film comprises a base layer and a heat sealing layer. The base layer contains a crystallized lactate polyester composition (A) containing a polylactic acid and a lactate polyester and having a melting point of 120°C or higher. The heat sealing layer contains an amorphous lactate polyester composition (B) containing an amorphous polylactic acid having a softening point of 40 to 110°C or a polylactic acid and a lactate polyester and having a softening point of 40 to 110°C.

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CLAIMS

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[Claim(s)]

[Claim 1] The heat-sealing film characterized by to be the heat-sealing film which consists of a base material layer and a heat-sealing layer, for said base material layer to consist of a crystallized lactic-acid system polyester constituent (A) with a melting point [ containing polylactic acid and lactic-acid system polyester ] of 120 degrees C or more, and for said heat-sealing layer to consist of a lactic-acid system polyester constituent (B) of the amorphism nature of 40-110 degrees C of softening temperatures containing the polylactic acid or polylactic acid, and lactic-acid system polyester of the amorphism nature of 40-110 degrees C of softening temperatures.

[Claim 2] The heat-sealing film according to claim 1 whose glass transition temperature the lactic-acid system polyester in a lactic-acid system polyester constituent (A) has a lactic-acid unit and a polyester unit in 10:90-90:10 by the weight ratio, and weight average molecular weight is 60 degrees C or less or more in 10,000 and the ratio (L/D ratio) of L bodies and D object of said lactic-acid unit or whose ratio (D/L ratio) of D object and L bodies is 100 / 0 - 97/3 in a mass ratio.

[Claim 3] The lactic-acid system polyester in a lactic-acid system polyester constituent (A) is Japanese Industrial Standards K. 7198 Heat-sealing film according to claim 1 whose storage modulus in 20 degrees C is the thing of 2.5 or less GPas in A law.

[Claim 4] a heat-sealing film -- K of Japanese Industrial Standards 7198 A -- heat-sealing film according to claim 1 whose minimum value of the storage modulus below temperature lower 20 degrees C than the melting point is 40-4,000MPa in law.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to containers, such as a package bag which comes to carry out thermoforming of the heat-sealing film and this film suitable for a package or receipt of various kinds of food which gives thermal melting arrival, a drink, a chemical, miscellaneous goods, etc. or a case, and a lightweight container.

[0002]

[Description of the Prior Art] Although the amount with huge plastics is used in recent years, the trash has caused terrestrial environmental problems, such as a threat to the lack of reclaimed ground, scene inhibition, and a marine organism, and environmental pollution. The plastics called general-purpose resin currently generally used conventionally is polyethylene, polypropylene, polystyrene, a polyvinyl chloride, polyethylene terephthalate, etc., and incineration and reclamation are performed as the disposal approach of these resin. However, since the combustion calorie of these resin is high when there is a problem in these disposal approaches and it incinerates resin, such as polyethylene, polypropylene, and polystyrene, it is easy to damage a furnace and the life of a furnace is shortened. On the other hand, although a combustion calorie is low in a polyvinyl chloride, generating gas harmful at the time of incineration is known. Also in reclamation, since these general-purpose resin has high chemical stability, remaining semipermanently, not decomposing but stopping the original form is known, and it has become one of the causes which the lack of reclaimed ground aggravates.

[0003] Moreover, when easily discarded in natural environment, for the stability, a fine sight is spoiled, or a marine organism, birds, etc. carry out an adding diet accidentally, and it has become the cause of environmental destruction -- a precious biomass decreases. In order to solve these problems, research of a biodegradability polymer is done briskly recently. The polymer of polyhydroxy carboxylic acids is in one of the resin which attracts attention by the biodegradability polymer. Unlike general plastics, full decomposition of these polymers is carried out easily, and, finally they become water and a carbon dioxide.

[0004] Moreover, since the combustion calorie is low, also when it destroys by fire, it has the description which does not damage a furnace and does not generate the still more harmful gas at the time of combustion. a start raw material -- playback -- since an easy biomass can be used, it can be freed from drained petroleum resources. From these advantages, it is expected as an alternative of general-purpose resin.

[0005] Although the polymer of polyhydroxy carboxylic acids has biodegradability and a moldability, polylactic acid and polyhydroxy butyrate have high practicality especially. However, there was brittleness, or there are problems, such as being inferior to workability, and the industrial application was limited, respectively. To improve brittleness, while especially polylactic acid had held the transparency is desired.

[0006] In order to improve the brittleness of polylactic acid, various examination is performed, and especially, addition of a plasticizer was known as the general approach of polymer reforming, and has

been considered early. Conventionally, the film into which paper and synthetic resin were processed, a sheet or aluminum foil, etc. is used as a package of the liquefied objects various kinds of food, a drink, a chemical, for miscellaneous goods, etc., a powdery and granular material, and a solid, or receipt material. the bag aiming at a package or receipt since especially a film and a sheet have the description excellent in \*\*, such as a water resisting property, transparency, reinforcement, thermoforming nature, and low cost nature, and a case -- or thermoforming is carried out and it is used for many applications as a lightweight container. Thermal melting arrival nature and thermal resistance are mentioned to the important thing as demand characteristics to these packages or receipt material.

[0007] The film and sheet which consist of synthetic resin are processed into various bags or a case by using the thermal melting arrival nature of resin and pasting up one or more ways, bending. Moreover, a film and a sheet are fabricated by the lightweight container which has rigidity and packs contents, such as food, a drink, a chemical, and miscellaneous goods, by the hot-forming approaches, such as a vacuum forming, vacuum pressure sky shaping, hot-platen pressure forming, and a deep-drawing vacuum forming.

[0008] After these containers insert contents, it carried out hot forming of a film, a sheet, or them for each other's opening, and a lid is pasted up, \*\* is used by being carried out in many cases, and thermal melting arrival is used also for this. Thus, a synthetic-resin film and a sheet use the property of thermal melting arrival, various processings are carried out, practical use is presented, and the adhesive strength of the part which carried out thermal melting arrival on that occasion, and the so-called seal reinforcement and its so-called appearance serve as an important property.

[0009] These containers, a film, and a sheet moreover, from the thermal resistance on storage and transportation Usually, the lightweight container which inserts the contents which the thermal resistance of 60 degrees C or more was needed, and were heated [ food / of structure length ], For example, in order that the hot philharmonic container used for the hood pack which packs food, such as rice and deep-fried dishes, in simple, a daily dish container or a jam, a pudding, and jelly may carry out \*\* after the thermal resistance in 80 degrees C or more is needed and it puts in contents, thermal melting arrival nature is needed.

[0010] Although ebullition underwater and the approach of improving the thermal resistance of decreasing contraction from 66% to 4% by the heat test for 1 minute are shown to the U.S. Pat. No. 5,076,983 number official report by by carrying out the heat set of the 130 degrees C of the oriented films of polylactic acid for 1 minute in order to solve these heat-resistant problems The way things stand, the film which heat sealing cannot do this film since it has already crystallized, and consists of polylactic acid was hard, and, in many cases, there was a trouble of being difficult for presenting practical use.

[0011] Moreover, the lactic-acid system polymer layered product using the lactic-acid system polyester copolymer which is made to carry out copolymerization of polylactic acid or a lactic-acid component, and the polyester component to JP,10-151715,A, and is obtained as a base material layer and a heat-sealing layer has the thermal resistance of 60 degrees C or more, and the outstanding seal reinforcement, and it is indicated that thermal melting arrival is possible. However, it had the fault that what used polylactic acid for the base material layer was hard, and it was weak, and the thing using the lactic-acid system polyester copolymer as a base material layer had intense bleed out about what impact strength and flexibility were extended rather than was [ and ] enough about a non-extended thing, and these had the problem of being difficult for presenting practical use.

[0012]

[Problem(s) to be Solved by the Invention] The technical problem which this invention tends to solve is to offer the heat-sealing film which consists of the oriented film or the sheet which presents the heat-sealing film which consists of the non-oriented film or sheet which has the outstanding shock resistance and flexibility, thermal resistance and seal reinforcement, the heat-sealing film that has low bleed out nature, the especially excellent impact strength, flexibility, thermal resistance, and seal reinforcement, the thermal resistance excellent in the list and seal reinforcement, and low bleed out nature.

[0013]

[Means for Solving the Problem] By using the crystallized lactic-acid system polyester constituent (A) with a melting point of 120 degrees C or more which contains polylactic acid and lactic-acid system polyester in a base material layer, as a result of inquiring wholeheartedly, in order that this invention persons may solve the above-mentioned technical problem Moreover, by using the lactic-acid system polyester constituent (B) of the amorphism nature of 40-110 degrees C of softening temperatures which contain the polylactic acid or polylactic acid, and lactic-acid system polyester of the amorphism nature of 40-110 degrees C of softening temperatures in a heat-sealing layer If the outstanding thermal resistance and seal reinforcement are presented, it has the impact strength and flexibility which it excelled if it was in the non-oriented film or the sheet further and it was in the oriented film or the sheet, it came to complete header this invention for presenting low bleed out nature.

[0014] Namely, this invention is a heat-sealing film which consists of a base material layer and a heat-sealing layer. Said base material layer consists of a crystallized lactic-acid system polyester constituent (A) with a melting point [ containing polylactic acid and lactic-acid system polyester ] of 120 degrees C or more. The heat-sealing film characterized by said heat-sealing layer consisting of a lactic-acid system polyester constituent (B) of the amorphism nature of 40-110 degrees C of softening temperatures containing the polylactic acid or polylactic acid, and lactic-acid system polyester of the amorphism nature of 40-110 degrees C of softening temperatures is offered.

[0015]

[Embodiment of the Invention] The base material layer used for this invention is a layer for realizing good thermal resistance, and shock resistance and the good physical properties of flexibility, and consists of a crystallized lactic-acid system polyester constituent (henceforth a lactic-acid system polyester constituent (A)) with a melting point [ containing polylactic acid and lactic-acid system polyester (henceforth lactic-acid system polyester (A1)) ] of 120 degrees C or more.

[0016] The lactic-acid system polyester constituent (A) used for this invention is the purpose which obtains good thermal resistance and thermoforming nature, and a lactic-acid system polyester constituent with a melting point of 120-300 degrees C is used preferably the crystallized melting point of 120 degrees C or more. The thing of 100 / 0 - 97/3 (mass conversion) is preferably used for the lactic-acid system polyester constituent suitable for this purpose for the ratio (L/D ratio) of L bodies and D object or the ratio (D/L ratio) of D object and L bodies which is the optical isomer of the lactic-acid component in the polylactic acid which is the constituent of this lactic-acid system ester constituent, and lactic-acid system polyester (A1). What is necessary is just to manufacture using the lactic-acid component which has this above-mentioned D/L ratio or a L/D ratio as a raw material by the manufacturing method mentioned later, for example, in order to obtain the polylactic acid and lactic-acid system polyester (A1) of such a D/L ratio or a L/D ratio.

[0017] Moreover, the lactic-acid system polyester (A1) used for this invention is the purpose which acquires good shock resistance and flexibility, and it has a lactic-acid unit and a polyester unit in 10:90-90:10 by the weight ratio, and weight average molecular weight is 10,000 or more, and a polymer 60 degrees C or less is used for glass transition temperature.

[0018] On the other hand, the heat-sealing layer used for this invention is a layer for carrying out thermal melting arrival by the approach by heat sealing etc., and consists of a lactic-acid system polyester constituent (henceforth a lactic-acid system polyester constituent (B)) of the amorphism nature of 40-110 degrees C of softening temperatures containing the polylactic acid or polylactic acid, and lactic-acid system polyester (henceforth lactic-acid system polyester (B1)) of the amorphism nature of 40-110 degrees C of softening temperatures. However, the polylactic acid of the amorphism nature said by this invention or the lactic-acid system polyester constituent of amorphism nature means what the peak of the melting point is not accepted in with the measuring method of JIS-K-7121.

[0019] Since the lactic-acid system polyester constituent (B) containing the polylactic acid or polylactic acid, and lactic-acid system polyester (B1) of the amorphism nature used for a heat-sealing layer realizes thermal melting arrival nature, as for the softening temperature, 40-110 degrees C of 40-100-degree C things are more preferably used by softening temperature. The thing of 96 / 4 - 4/96 (mass conversion) is preferably used for the polylactic acid or the lactic-acid system polyester constituent (B) suitable for this

purpose for the ratio (L/D ratio) of L bodies and D object of the lactic-acid component in this polylactic acid or lactic-acid system polyester (B1). What is necessary is just to manufacture using the lactic-acid component which has this above-mentioned L/D ratio as a raw material by the manufacturing method mentioned later, for example, in order to obtain polylactic acid and lactic-acid system polyester (B1) of such a L/D ratio.

[0020] Under the present circumstances, a certain thing of the temperature gradient with the softening temperature of the polylactic acid used for the melting point and the heat-sealing layer of the lactic-acid system polyester constituent (A) used for a base material layer or a lactic-acid system polyester constituent (B) is [ from / after that the both-sexes ability of the thermal resistance of the heat-sealing film of this invention and seal nature balances ] desirable 20 degrees C or more.

[0021] Moreover, it has a lactic-acid unit and a polyester unit in 10:90-90:10 by the weight ratio, and weight average molecular weight is 10,000 or more, and a polymer 60 degrees C or less is used for glass transition temperature in order to acquire shock resistance and flexibility also with the good lactic-acid system polyester (B1) used for this invention.

[0022] Thus, lactic-acid system polyester (A1) and lactic-acid system polyester (B1) which were mentioned above (The following, especially when lactic-acid system polyester (A1) and lactic-acid system polyester (B1) do not need to be distinguished, it may only be described as "lactic-acid system polyester".) By adding to polylactic acid, the outstanding shock resistance and flexibility can be given and it is used as an additive which can control the bleed out at the time of adding to polylactic acid further.

[0023] Here, the manufacturing method of the lactic-acid system polyester used for this invention is explained. This lactic-acid system polyester is the resultant to which the polyester component (b) which consists of a lactic-acid component (a), dicarboxylic acid (c), and diol (d) was made to react in 10:90-90:10 with a mass ratio.

[0024] The lactic-acid unit in the lactic-acid system polyester used for this invention (a') points out the chemical structure unit which consists of a lactic-acid component (a), and a polyester unit (b') points out the chemical structure unit which consists of polyester (b) which consists of dicarboxylic acid (c) and diol (d) similarly.

[0025] The lactic-acid system polyester (A1) used for this invention is obtained by choosing the class of the dicarboxylic acid (c) mentioned later and diol (d), and adjusting those operating rates and reaction conditions so that the weight average molecular weight may be 10,000 or more and glass transition temperature may become 60 degrees C or less.

[0026] It is a weight ratio, the operating rate of a lactic-acid component (a) and a polyester component (b) has the desirable range of 90:10-10:90, its range of 40:60-90:10 is still more desirable, its range of 50:50-90:10 is further more desirable, and its range of 50:50-85:15 is further especially desirable.

[0027] As a lactic-acid component (a), a lactic acid, lactide, polylactic acid, or poly lactide is mentioned. Lactide is the compound in which lactic-acid dyad carried out annular dimerization, and is a monomer which has a stereoisomer, and the meso-lactide which consists of L-lactide which consists of L-lactic acid dyad, D-lactide which consists of D-lactic-acid dyad, a D-lactic acid, and L-lactic acid is mentioned.

[0028] It crystallizes and the copolymer only containing L-lactide or D-lactide is high-melting. Therefore, it is used as lactic-acid system polyester used for a base material layer or a heat-sealing layer by combining at a rate which mentioned three kinds of lactide above according to the application.

[0029] Generally L-lactic acid or D-lactic acid is marketed in 80 - 90% of water solution. In this invention, a commercial lactic-acid water solution can be used directly. Many physical properties, such as the melting point of lactic-acid system polyester and melt viscosity, can be adjusted by changing the presentation ratio of L and D-lactic acid like lactide.

[0030] Under the present circumstances, as for a lactic-acid component (a), it is desirable to use polylactic acid or lactide. It is because the outstanding shock resistance can be given, the lactic-acid system polyester obtained serving as a block copolymer, and excelling in maintenance of transparency, and/or raising control of bleed out, when polylactic acid or lactide is used as a raw material.

[0031] The polyester component (b) used for this invention carries out the ester reaction of dicarboxylic acid (c) and the diol (d), and is obtained.

[0032] As such dicarboxylic acid (c), the dicarboxylic acid of the carbon atomic numbers 4-45, such as aromatic series dicarboxylic acid like the partial saturation aliphatic series dicarboxylic acid; phthalic acid like the aliphatic series dicarboxylic acid; fumaric acid like a succinic acid, a glutaric acid, an adipic acid, a pimelic acid, a suberic acid, an azelaic acid, a sebacic acid, Deccan dicarboxylic acid, cyclohexane dicarboxylic acid, and dimer acid, a terephthalic acid, isophthalic acid, and naphthalene dicarboxylic acid, is mentioned, for example. However, dicarboxylic acid (c) is not limited to these. Moreover, two or more kinds of these dicarboxylic acid can be used together, and it can also be used.

[0033] The dicarboxylic acid of the carbon atomic numbers 20-45 which may have the dicarboxylic acid or the unsaturated bond of the carbon atomic numbers 4-12 which may have the unsaturated bond like a succinic acid, an adipic acid, a sebacic acid, Deccan dicarboxylic acid, cyclohexane dicarboxylic acid, dimer acid, a phthalic acid, a terephthalic acid, isophthalic acid, dimer acid, or hydrogenation dimer acid also in these dicarboxylic acid (c) is mentioned preferably. Furthermore, since the polyester constituent which excelled [ constituent / which consists of lactic-acid system polyester which used the dimer acid of the carbon atomic numbers 20-45 also in these / lactic-acid system polyester ] in transparency, and was excellent in shock resistance can be offered, the dimer acid of the carbon atomic numbers 20-45 is especially mentioned as a desirable thing.

[0034] If dimer acid is 24 or more carbon atomic numbers [ which are generated by the heat dimerization reaction of 12 or more carbon atomic numbers unsaturated fatty acid etc. ] dicarboxylic acid, as for especially oleic acid and talloil fatty acid that serve as a start raw material although it can be used without a limit, what has low toxicity is desirable. The dimer acid which is considered that the reaction mechanisms of a heat dimerization reaction are the devices with the main Diels-Alder ring closure by heating in this invention although various things are proposed and which includes alicyclic structure in intramolecular is used more preferably.

[0035] Although there are what has a partial saturation double bond in intramolecular, and a fatty acid saturation-ized by hydrogenation in such dimer acid, which dimer acid of partial saturation or saturation can also be used.

[0036] As a commercial item of dimer acid, the dimer (en poles 1061 and 1062 by the cog varnish (Cognis) company) of the aliphatic series unsaturated carboxylic acid of the carbon atomic number 18, the dimers (company en pole 1008 etc.) of the aliphatic series saturation dimer acid of the carbon atomic number 18, etc. are mentioned. Although the monomer acid and the trimer acid are included in the dimer acid of these marketing a little in many cases, you may be such dimer acid. 90% or more of the purity of dimer acid is desirable, and 95 more% or more of its thing is desirable. The nonpoisonous thing of any dimer acid component in which the use to a food packaging material is accepted is desirable.

[0037] As for the operating rate of dicarboxylic acid (c), it is desirable to use more than 10 weight sections to the lactic-acid system polyester component 100 weight section, and also having more than 30 weight sections is more desirable. In addition, since glass transition temperature (Tg) tends to become high, when using aromatic series dicarboxylic acid, it is desirable [ the polyester using aromatic series dicarboxylic acid ] to choose the amount and ingredient of extent which does not spoil the grant effectiveness of shock resistance and flexibility. The rate of aliphatic series dicarboxylic acid to the total quantity of dicarboxylic acid (c) has 30 - 100% of the weight of the desirable range.

[0038] On the other hand as diol (d), for example Ethylene glycol, 1, 3-propanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1, 7-heptane diol, 1, 8-octanediol, 1, 9-nonane diol, 1, 10-Deccan diol, 1, and 11-undecane diol, 1, 12-dodecane diol, 1, 4-cyclohexane dimethanol, propylene glycol, 1,3-butanediol, 1, 2-butanediol, neopentyl glycol, 3, and 3-diethyl-1,3-propanediol, [0039] 3 and 3-dibutyl-1,3-propanediol, 1, 2-butanediol, 1, 2-pentanediol, 1, 3-pentanediol, 2, 3-pentanediol, 2, 4-pentanediol, the 2-methyl -2, 4-pentanediol, 1, 4-pentanediol, 1, 2-hexandiol, 1, 3-hexandiol, [0040] The aliphatic series diol of the carbon atomic numbers 2-45, such as 1, 4-hexandiol, 1, 5-hexandiol, n-butoxy ethylene glycol, cyclohexane dimethanol, hydrogenation bisphenol A, dimer diol, a diethylene glycol, dipropylene glycol, triethylene glycol, a polyethylene glycol, a polypropylene glycol, a



polytetramethylene glycol, a xylylene glycol, and a phenylethylene glycol, is mentioned. They can also be used, using together two or more kinds of such diols.

[0041] Also in such diols, the aliphatic series diol of the carbon atomic numbers 2-45 which may have the unsaturated bond is desirable, and especially the aliphatic series diol of the carbon atomic numbers 20-45 which may have the carbon atomic number 2 which may have the unsaturated bond - 12 aliphatic-series diol, or an unsaturated bond is desirable. Furthermore, if the lactic-acid system polyester guided also in these from the polyester component which used the dimer diol of the carbon atomic numbers 20-45 is added to polylactic acid, since the polyester constituent which was excellent in transparency and was excellent in shock resistance can be offered, it is especially desirable.

[0042] It is diol obtained by returning dimer acid, dimer diol has the desirable thing of the carbon atomic numbers 20-45, and the reductant of the dimer of the aliphatic series unsaturated carboxylic acid of the carbon atomic number 18, its dimer diol of the carbon atomic number 36, etc. are more desirable. 90% or more of the purity of dimer diol is desirable, and is desirable. [ 95 more% or more of ] Dimer acid and dimer diol may be used independently respectively, and even if they use both together, they are not cared about. As a commercial item of dimer diol, the dimer diol of the carbon atomic number 36 which returned the dimer of the aliphatic series unsaturated carboxylic acid of the carbon atomic number 18 by the Toagosei chemistry company is mentioned.

[0043] The rate of the aliphatic series diol to the total quantity of diol (d) has 30 - 100% of the weight of the desirable range. Moreover, as for the operating rate of diol (d), it is desirable to use more than 10 weight sections to the lactic-acid system polyester component 100 weight section, and also having more than 30 weight sections is more desirable.

[0044] Although there is polyester (b) from a liquefied thing to a solid-state-like thing, the melting point and the pour point become low, so that percentage, such as dimer acid, dimer diol, and propylene glycol which has a side chain, 1,3-butanediol, is high. For this reason, since the lactic-acid system polyester which uses as a raw material the polyester (b) which consists of these can give the shock resistance which was more excellent in polylactic acid by an elastic modulus becoming low, and flexibility, it is desirable.

[0045] It is more desirable that it is in the range of 10,000-200,000, it is desirable that it is 2,000 or more although not restricted to especially the weight average molecular weight of the polyester (b) which is made to carry out the ester reaction of dicarboxylic acid (c) and the diol (d), and is obtained, and especially the thing in the range of 20,000-100,000 is [ it is still more desirable that it is 5,000 or more, and / it is still more desirable that it is in the range of 20,000-150,000, and ] desirable.

[0046] The polyester (b) of the with a molecular weight of 100,000 or more amount of giant molecules can be manufactured by making an acid anhydride or the poly isocyanate react to the polyester which is made to carry out the ester reaction of dicarboxylic acid (c) and the diol (d), and is obtained as a chain expanding agent further. The polyester component (e) used by this invention also includes the poly isocyanate denaturation polyester obtained in this way, using the poly isocyanate as a chain expanding agent.

[0047] as the manufacture approach of polyester (b) -- dicarboxylic acid (c) and diol (d) -- a mole ratio - 1:1 to 1:1.5 -- the bottom of nitrogen-gas-atmosphere mind -- a 130 degrees C - 240 degrees C temperature requirement -- 1 hour -- 5-10 degrees C -- coming out comparatively and carrying out a temperature up gradually, it agitates and water is distilled off. Superfluous diol is distilled off after a 4 - 12-hour reaction, raising whenever [ reduced pressure ] by 90-0.1KPa gradually. Viscous high polyester (b) can be obtained after 2 - 3-hour reduced pressure by making it react at 200-240 degrees C for 4 to 12 hours, adding an ester interchange catalyst and an antioxidant and decompressing by 0.5 or less KPas.

[0048] In order to reduce the coloring which poses a problem at the time of an ester exchange reaction, the approach of using 10-1000 ppm of metal catalysts, such as Ti, Sn, Zn, Mg, aluminum, Zr, and Hf, to polyester, performing an ester interchange, and adding 10-1000 ppm of antioxidants, such as a phosphite compound, further is desirable.

[0049] As a metal catalyst, titanium tetraisopropoxide, titanium tetra-butoxide, titanium oxy-acetylacetonato, octanoic-acid tin, 2-ethylhexanoic acid tin, acetylacetonato zinc, zinc acetate,



magnesium acetate, 4 zirconium chlorides, 4 chlorination hafnium, a 4 chlorination hafnium THF complex, etc. are mentioned, for example.

[0050] It can also make polyester the letter of branching for melt viscosity reduction that macromolecule quantification is carried out in order to give the shock-proof grant effectiveness of having excelled further the polyester obtained by the above-mentioned manufacture approach.

[0051] Macromolecule quantification of polyester should just make polyester react by the well-known approach conventionally with an acid anhydride or multiple-valued isocyanate. That is, adding an acid anhydride or multiple-valued isocyanate in polyester, and decompressing in the range of 0.5-0.1KPa at 180 degrees C - 210 degrees C, in the case of a carboxylic anhydride, in the case of multiple-valued isocyanate, it is ordinary pressure, and it can manufacture the polyester (b) of the amount of macromolecules by performing a reaction for 3 hours.

[0052] As an acid anhydride mentioned above, it is the carboxylic anhydride of the compound which has two or more carboxyl groups in 1 intramolecular. As such a carboxylic anhydride, succinic-anhydride, anhydrous cyclohexane dicarboxylic acid, phthalic anhydride, maleic-anhydride, trimellitic anhydride, and pyromellitic acid 2 anhydride etc. is mentioned, for example. Two or more sorts can also be used together and used for a carboxylic anhydride.

[0053] The multiple-valued isocyanate used for the macromolecule quantification reaction of polyester is a compound which has two or more isocyanate radicals in 1 intramolecular. the urethane bond content polyester obtained -- a parenthesis top and a line -- to a case to obtain what has structure, the thing of two functionality is desirable.

[0054] As 2 organic-functions isocyanate mentioned above, hexamethylene di-isocyanate, 2, 4-tolylene diisocyanate, 2, 5-tolylene diisocyanate, toluene diisocyanate, xylylene diisocyanate, diphenylmethane diisocyanate, 1, 5-naphthylene diisocyanate, isophorone diisocyanate, hydrogenation diphenylmethane diisocyanate, etc. are mentioned, for example. Two or more sorts can also be used together and used for such 2 organic-functions isocyanates.

[0055] Furthermore, in order to make polyester into the letter of branching, you may make it react by the well-known approach conventionally, using the thing of three or more functionality as multiple-valued isocyanate. In this case, the obtained polymer chain becomes star-like. In order to obtain such a thing, the compound which is represented by what was embellished with 2 functionality isocyanate in pentaerythritol and which was embellished with 2 functionality isocyanate in polyhydric alcohol is mentioned. As multiple-valued isocyanate, it can be possible, and can react, without making 2 functionality isocyanate use together and gel the little isocyanate of three or more functionality, and macromolecule quantification also of also using together several sorts of multiple-valued isocyanates can be carried out.

[0056] The approach of mixing a carboxylic anhydride or multiple-valued isocyanate to the reactant immediately after completing the ester polymerization reaction of diol (c) and dicarboxylic acid (d), adding anew in the approach of agitating in the state of short-time melting, and making it react or the polyester obtained by the polymerization, and carrying out melting mixing may be used for the reaction of polyester, and a carboxylic anhydride or multiple-valued isocyanate.

[0057] When using multiple-valued isocyanate, especially the method of making it dissolve in a cosolvent and making both polyester and isocyanate heat and react to it is desirable. Thereby, homogeneity can be made to distribute the poly isocyanate in aliphatic series polyester very much. 70 degrees C - 220 degrees C of temperature which makes an acid anhydride or multiple-valued isocyanate mix and react to polyester are usually 100 degrees C - 190 degrees C preferably.

[0058] It is desirable to use ester polymerization catalysts, such as N,N-dimethylaniline, tin octanoate, 2-ethylhexanoic acid tin, a dibutyl tin JIRAU rate, and tetra-isopropyl titanate, or an urethane catalyst on the occasion of the reaction of multiple-valued isocyanate. 0.01 % of the weight - 5% of the weight of polyester (II') is desirable still more desirable, and the amount of an acid anhydride and the multiple-valued isocyanate used is 0.1 % of the weight - 1 % of the weight.

[0059] Since it will be easy to become the cause of gelation in the case of polyester composition when using the raw material which causes coloring and decomposition and has an unsaturated bond if oxygen

enters in the system of reaction, in case reduced pressure of catalyst addition etc. is canceled, it is desirable to fully perform the permutation in inert gas, such as nitrogen.

[0060] The weight average molecular weight of 10,000 or more things is [ the lactic-acid system polyester used for this invention ] desirable. Furthermore, in order to give [ while maintaining transparency, and/or ] the outstanding shock resistance, raising control of bleed out, the thing of the range of 20,000-200,000 has desirable weight average molecular weight, the thing of the range of 30,000-200,000 is more desirable, and especially the thing of the range of 40,000-150,000 is desirable.

[0061] It is desirable in order with [ weight average molecular weight ] 10,000 [ or more ] to be able to give the sufficient plastic effectiveness and impact strength and not to reduce the transparency of a resin constituent. On the other hand, although there is especially no upper limit of molecular weight, generally it is 200,000 or less and is 150,000 or less from the ease of using it.

[0062] The glass transition temperature ( $T_g$ ) of lactic-acid system polyester has the desirable range of -70 degrees C - 60 degrees C, and especially its range that is -65 degrees C - 60 degrees C is desirable. Weight average molecular weight is 10,000 or more, and 2.5 or less GPas ( $E'$ ) of storage moduli [ in / in the lactic-acid system polyester (A1) and lactic-acid system polyester (B1) of this invention which designed glass transition temperature so that it might become 60 degrees C or less / the 20 degrees C ] are the thing of 0.1-2.0GPa preferably.

[0063] the lactic-acid system polyester (A1) of this invention -- or (B1) as the concrete manufacture approach For example, the approach to which (1) lactide and a polyester component (b) are made to react under existence of a polymerization catalyst, (2) Carry out the polycondensation of the lactic acid, obtain polylactic acid, and this polylactic acid is further dehydrated under the polyester (component b) existence. How to obtain a polylactic acid-polyester block copolymer by carrying out a polycondensation, (3) The method of obtaining a polylactic acid-polyester block copolymer etc. is mentioned by carrying out melting kneading of the polylactic acid and the polyester component (b) which were obtained from a lactic acid or lactide under existence of an ester interchange catalyst.

[0064] First, the copolymerization method of (1) lactide and a polyester component (b) is explained. In order that the reaction temperature of reaction temperature of 180 degrees C or less may be more preferably desirable 200 degrees C or less and it may prevent preferably 220 degrees C or less of decomposition of lactide and coloring in that coloring and decomposition of lactide are prevented, it is desirable to react under the ambient atmosphere of inert gas, such as nitrogen and an argon. Moreover, since existence of the moisture in the system of reaction is not desirable, it is necessary to fully dry aliphatic series polyester.

[0065] The basis, polyester (b), and lactide of such conditions are mixed at 100 degrees C - 220 degrees C, and it dissolves. under the present circumstances, the need -- responding -- such sum total weight -- receiving -- 1 - 30 weight section -- 5 - 30 weight section and more desirable nonresponsive solvents, such as toluene of 15 - 30 weight section, may be used preferably. Furthermore, 50-2000 ppm is added for a polymerization catalyst (for example, tin octanoate) to the total quantity of polyester (b) and lactide under inert gas ambient atmospheres, such as nitrogen and an argon, at 140-220 degrees C. the preparation ratio of polyester (b) and lactide -- a weight ratio -- (Polyester b):lactide = 10:90-90:10 -- desirable -- more -- desirable -- 40:60-90:10 -- 50:50-90:10, and especially a desirable thing are 50:50-85:15 further more preferably.

[0066] As a polymerization catalyst to be used, each catalyst generally known as an esterification catalyst and a ring-opening-polymerization catalyst is usable, for example, alkoxide, such as Sn, Ti, Zr, Zn, germanium, Co, Fe, aluminum, Mn, and Hf, acetate, an oxide, a chloride, etc. are mentioned. Also in these, since the reaction is early, tin octylate, 2-ethylhexyl \*\*\*\*, dibutyltin dilaurate, tetra-isopropyl titanate, tetrabutoxytitanium, titanium oxy-acetylacetonato, iron (III) acetylacetonato, iron (III) ethoxide, an aluminum iso PUROPOKI side, and aluminium acetylacetonato are desirable in the end of tin powder.

[0067] Next, the copolymerization method of (2) lactic acids and polyester (b) is explained. After carrying out the polycondensation of the lactic acid by the approach of well-known common use and obtaining polylactic acid, polyester (b) can be added to this and lactic-acid system polyester can be

obtained by performing a polycondensation reaction further. Various techniques are indicated and the polycondensation of a lactic acid is good at the polylactic acid obtained by one of the approaches of them. What is necessary is just to adjust the molecular weight of polylactic acid suitably in consideration of the molecular weight of desired lactic-acid system polyester in this invention, with the preparation ratio of a lactic-acid component (a) and a polyester component (b), and the number of end groups or molecular weight of polyester (b), since the grant effectiveness of shock resistance and flexibility is seen with [ the molecular weight of lactic-acid system polyester ] 10,000 [ or more ]. In addition, in a short time, since the lactic-acid system polyester of the amount of macromolecules is obtained, the copolymerization reaction after (Polyester b) addition is so desirable that polylactic acid is the amount of macromolecules.

[0068] Moreover, the approach of progressing a polymerization by using a solvent at the time of the polycondensation of a lactic acid, carrying out azeotropy of the solvent to water as an approach of raising the molecular weight of polylactic acid more, by carrying out selection use of the high-boiling point solvent which is easy to carry out azeotropy of the water, such as toluene, a xylene, an anisole, and diphenyl ether, and returning a solvent for this in the system of reaction again after dehydration distilling off with a drying agent etc. is also possible. Under the present circumstances, when the polymerization catalyst in the end of tin powder etc. mentioned above is used, a reaction becomes for a short time and is still more desirable.

[0069] In case mixed heating of the polylactic acid obtained from the polycondensation of a lactic acid and the polyester (b) is carried out and a polycondensation is advanced, in order to adjust the amount of end groups to a charge, diol and dicarboxylic acid may be added further. Its reaction 220 degrees C or less is desirable in order to prevent decomposition of a lactic-acid block, and coloring, and in order for the reaction condition in the case of a polycondensation to make molecular weight increase more, it is desirable to add the polymerization catalyst of octanoic-acid tin etc. and to decompress to 1 or less KPa in the end of tin powder it mentioned above. Furthermore, when the azeotropy dehydration polycondensation reaction which used the solvent is performed like the polycondensation reaction time of a lactic acid, the lactic-acid system polyester of the amount of macromolecules is obtained more, and it is more desirable.

[0070] Then, by carrying out melting kneading of the polylactic acid and polyester (b) which were obtained from (3) lactic acids or lactide under existence of an ester interchange catalyst explains how to obtain a polylactic acid-polyester block copolymer. Mixed heating of polylactic acid and the polyester (b) is carried out, and an ester exchange reaction is performed to the bottom of polymerization catalyst existence, such as octanoic-acid tin mentioned above. In order that a reaction condition may prevent decomposition of a lactic-acid block, and coloring, its reaction 220 degrees C or less is desirable, and it is still more desirable to carry out under inert gas ambient atmospheres, such as nitrogen and an argon. moreover, polylactic acid -- a lactic acid or lactide -- although obtained from which, since the lactic-acid system polyester of the amount of macromolecules is obtained, it is desirable, and as molecular weight of polylactic acid, in weight average molecular weight, 50,000 or more are desirable and it is 150,000 or more further more preferably 100,000 or more more preferably, so that the molecular weight of polylactic acid is high.

[0071] Moreover, since lactide is meltable to various solvents, it may be made to dissolve using solvents, such as toluene, benzene, a xylene, ethylbenzene, a tetrahydrofuran, dioxane, diphenyl ether, and a chlorobenzene, and each above-mentioned manufacturing method may be presented with it. By the way, as for the lactic-acid system polyester used for this invention, it is desirable that the closure of the hydroxyl group of the both ends or a piece end or the carboxyl group is carried out in a carboxylic acid or alcohol. It is because effectiveness is in this molecular weight fall prevention for this to have a possibility that the hydroxyl group and carboxylic acid of lactic-acid system polyester may reduce the molecular weight of a parent polymer at the time of a blend, and to close the end of this lactic-acid system polyester. It is more desirable to close, since there are many end groups especially when molecular weight uses 10,000 or less lactic-acid system polyester.

[0072] The preservation stability of lactic-acid system polyester can be further raised by carrying out

extract removal of the polymerization catalyst with a solvent, or furthermore, carrying out deactivation of the polymerization catalyst by the catalyst quencher after copolymerization of lactic-acid system polyester.

[0073] Since the polymerization catalyst which remains in these polylactic acid or lactic-acid system polyester may carry out reverse reaction and may carry out decomposition promotion, in case melting kneading is carried out, in order to prevent this, it is desirable removal or to carry out deactivation of the polymerization catalyst used at the time of these manufactures.

[0074] An approach which is washed while taking advantage in the resin pellet of lactic-acid system polyester, or mixing lactic-acid system polyester in the above-mentioned solution in the state of a solution and making a methanol / hydrochloric-acid water solution, acetones / hydrochloric-acid water solutions, or these mixed liquor precipitate-ize a polymer is mentioned to the concrete approach of removing a polymerization catalyst. It is possible for a minute amount residual monomer, oligomer, etc. to carry out washing removal by such approach at coincidence.

[0075] Moreover, after manufacture of lactic-acid system polyester, or manufacture, a catalyst quencher can be added and deactivation of the polymerization catalyst can be carried out. Although a catalyst quencher adheres to the polymerization catalyst in lactic-acid system polyester with the chelate's gestalt and is usually contained in lactic-acid system polyester, solvent cleaning etc. may remove it further.

[0076] the amount to which deactivation of the used polymerization catalyst is carried out although the addition of a catalyst quencher changes with the class of catalyst used in the case of manufacture of lactic-acid system polyester, and reaction conditions -- it is -- \*\*\*\*ing -- the polymer ejection front after lactic-acid system polyester polymerization reaction termination, and the time of kneading -- usually -- the use catalyst 1 weight section -- receiving -- 0.001 - 10 weight section -- desirable -- 0.1 - 5 weight section -- 0.5 - 3 weight section is added more preferably. Moreover, a catalyst quencher may be added and kneaded in the manufactured lactic-acid system polyester.

[0077] A chelating agent and/or the alkyl acid phosphate of especially the catalyst quencher used for this invention are desirable. Especially as a chelating agent, although not limited, ethylenediaminetetraacetic acid, disodium ethylenediaminetetraacetate, oxalic acid, a phosphoric acid, a pyrophosphoric acid, alizarin, an acetylacetone, a diethylenetriamine pentaacetic acid, triethylenetetramine 6 acetic acid, a catechol, 4-t-butyl catechol, an L(+)-tartaric acid, DL-tartaric acid, a glycine, the chromotropic acid, a benzoylacetone, a citric acid, a gallic acid, dimercapto propanol, triethanolamine, cyclohexanediaminetetraacetic acid, a JITORU oil tartaric acid, and a dibenzoyl tartaric acid are mentioned, for example.

[0078] Moreover, alkyl acid phosphate forms the metal ion and complex of a catalyst which are contained in hydroxycarboxylic acid system polyester, it makes catalytic activity lose, and shows the cutting depressor effect of a polymer chain. As alkyl acid phosphate, the mixture, such as alkyl acid phosphate, phosphonate, and alkyl phosphonic acid, is pointed out.

[0079] As alkyl acid phosphate, the mixture, such as well-known alkyl acid phosphate which is mentioned in a U.S. Pat. No. 5686540 specification, phosphonate, and alkyl phosphonic acid, is mentioned conventionally, for example. The effectiveness which was excellent in workability since an alkyl-acid-phosphate component had good solubility with an organic solvent, was excellent in reactivity with lactic-acid system polyester, and was excellent in deactivation of a polymerization catalyst is shown.

[0080] Although especially the polymerization invert ratio of a copolymerization reaction is not restricted even if it is the manufacture approach of which the above-mentioned lactic-acid system polyester, measuring a polymerization invert ratio with gel permeation chromatography (GPC), it is 160-180 degrees C, and it is desirable for a polymerization appending rate to reach to 90 - 99% preferably for 1.5 hours or more by making it react more preferably for 3 hours or more for 2.5 hours or more.

[0081] In the case of ring breakage copolymerization, the lactic-acid system polyester of this invention is possible also for manufacturing using the usual reaction vessel, and the manufacturing installation of the CSTR type corresponding to continuation manufacture for this can be used for it. More, about a hyperviscous thing, at the copolymerization reaction which used the usual reaction vessel, churning

effectiveness falls and coloring by local heating and decline in conversion are caused. In such a case, it is agitated by homogeneity and use of a static mixer with small shearing stress is desirable.

[0082] Moreover, although this reaction can also be performed only by the static mixer, before it uses the usual reaction vessel in the phase where viscosity is low and a polymerization anaphase hyperviscosity-izes, it is still more desirable in the semantics that the approach of using a static mixer mixes a polymerization initiator to homogeneity. It serves as elasticity, so that the viscoelasticity in the room temperature of lactic-acid system polyester has many carbon atomic numbers of the principal chain of the diol which constitutes the aliphatic series polyester used for copolymerization. Moreover, it becomes elasticity as the amount of dicarboxylic acid used together with dimer acid increases.

[0083] Next, when the lactic-acid system polyester constituent (B), (the following, especially lactic-acid system polyester constituent (A), and the lactic-acid system polyester constituent (B) containing the lactic-acid system polyester constituent (A) or polylactic acid, and lactic-acid system polyester (B1) containing the polylactic acid and lactic-acid system polyester (A1) which are used for this invention do not need to be distinguished, it may only be described as a "lactic-acid system polyester constituent".) is explained.

[0084] Although especially the weight average molecular weight of the polylactic acid used for the lactic-acid system polyester constituent used for this invention is not limited, generally its 50,000 or more weight average molecular weight is desirable, 70,000 or more are more desirable, and 100,000 especially or more are desirable, and its 500,000 or less thing is desirable.

[0085] The lactic-acid system polyester used for this invention may be kneaded with polylactic acid as it is, and can also be used in the state of the masterbatch beforehand blended by polylactic acid and high concentration.

[0086] the ratio into which the effectiveness of this invention attains the lactic-acid system polyester which constitutes the lactic-acid system polyester constituent used for this invention, and the kneading ratio of polylactic acid -- it is -- \*\*\*\*ing -- desirable -- lactic-acid system polyester:polylactic acid =3:97-70:30 -- it is -- further -- desirable -- 5:95-50:50 -- it is 5:95-40:60 especially preferably. Within the limits of this presentation ratio, the thermal resistance of a blend object, shock resistance, and bleed out nature are improved with sufficient balance.

[0087] Although the kneading conditions of lactic-acid system polyester and polylactic acid serve as kneading more than the melting point of polylactic acid, since the melting point of the lactic-acid system polyester used for this invention is 140 degrees C - 170 degrees C, it is desirable that it is around 180-200 degrees C. To exceed 200 degrees C greatly, based on the molecular weight fall of polylactic acid, it is necessary to adjust mixing time, a kneading rotational frequency, etc.

[0088] As for a kneading-machine machine, an extruder, a kneader, a batch type kneading machine, etc. are used. Moreover, kneading in a reaction vessel, and when viscosity is high, the blend which used the static mixer is also possible. Although the same blend is possible also for the wet blend using a solvent, it is more desirable to carry out for a short time, in order to decompress under an elevated temperature and to prevent separation of a polymer in case a solvent is devolatilized.

[0089] Since the lactic-acid system polyester constituent used for this invention shows the outstanding shock resistance, when it uses as a base material layer or a heat-sealing layer, it presents the film impact which has the E. I. du Pont de Nemours impact strength which was preferably excellent in 0.3-5J, or was preferably excellent in 1-10J more than 1J with the extension heat set sheet more than 0.2J with a 250-micrometer non-oriented film or an oriented film.

[0090] Furthermore, since the lactic-acid system polyester constituent used for this invention shows the outstanding flexibility, when it uses as a base material layer or a heat-sealing layer, it shows the range of 0.5-3.0GPa, and the storage modulus (E') which was more preferably excellent in the range of 0.6-2.4GPa at a room temperature with the measuring method based on JIS-K-7198 and A law.

[0091] Moreover, the lactic-acid system polyester constituent which adds the lactic-acid system polyester used for this invention to polylactic acid, and is obtained can maintain the outstanding transparency. For example, the Hayes value of a press sheet with a thickness of 250 micrometers which added the lactic-acid system polyester 30 weight section to the polylactic acid 100 weight section is 1 -

25% still more preferably 1 to 30% more preferably 35% or less.

[0092] However, since the boundary line of a film or a sheet is not distinguished clearly, in this invention, it shall name a film and a sheet generically and shall call it a film.

[0093] When the lactic-acid system polyester constituent containing the lactic-acid system polyester used for this invention presents the outstanding bleed out depressor effect, for example, no extending and the extension sheet of 10x10cm square and 250-micrometer thickness are left in 35 degrees C and the thermo hygostat of 80% of humidity, a bleeding object will not appear 60 days or more from this mold-goods front face.

[0094] The lactic-acid system polyester constituent containing polylactic acid or polylactic acid, and lactic-acid system polyester used for the base material layer or heat-sealing layer of this invention receives decomposition by hydrolysis, biodegradation, etc., even when it has good biodegradability and is abandoned all over the sea. For this reason, all over seawater, by the time the reinforcement as resin deteriorates and it does not maintain an appearance in several months, it can decompose. Moreover, if compost is used, by the time it does not stop the original form further for a short period of time, even if biodegradation will be carried out and it will destroy by fire, neither a toxic gas nor a toxic material will be discharged.

[0095] Next, the heat-sealing film of this invention is explained. Although especially the thickness of the heat-sealing film of this invention is not restricted, where a laminating is carried out, its tabular thing with a thickness of 5000 micrometers or less is desirable. Moreover, especially the thickness of a base material layer is not restricted, and 5-3000 micrometers is desirable, 5-200 micrometers is more desirable from reinforcement and economical efficiency, and the thing of the range of further 5-100 micrometers is also used preferably. Although especially the thickness of a heat-sealing layer is not restricted, either, when 1-30 micrometers is desirable from a viewpoint of membrane formation nature and a seal, and \*\* and economical efficiency are taken into consideration, 2-20 micrometers is 3-10 micrometers still more preferably more preferably.

[0096] The heat-sealing film of this invention may add the additive of well-known common use of other polymers, a plasticizer, a stabilizer, an anti-oxidant, an antiblocking agent, an antifogger, a coloring agent, etc. as the second and 3 component in the resin which constitutes spreading or this film on a front face if needed. As other polymers, aliphatic series polyester, polyvinyl alcohol, polyhydroxy butyrate-hydroxy BARIRETO, a starch system polymer, etc. may be contained.

[0097] As this additive, plasticizers, such as polyester plasticizers, such as 1,3-butanediol and an adipic acid, and a dioctyl phthalate, a polyethylene-glycol adipic acid, epoxidized soybean oil, a stabilizer like a carbodiimide, 2, 6-Gee tertiary butyl-4-methyl phenol (BHT), an anti-oxidant like a butylhydroxyanisole (BHA), a silica, an antiblocking agent like talc, a glycerine fatty acid ester, an antifogger like citric-acid mono-stearyl, titanium oxide, carbon black, a coloring agent like ultramarine blue, etc. are mentioned.

[0098] Although there are the heat-sealing method, the impulse-heat-sealing method, the fusing seal method, the impulse fusing seal method, the ultrasonic seal method, the RF seal method, etc. in the adhesion approach using thermal melting arrival, generally the heat-sealing method, the impulse-heat-sealing method, and the fusing seal method are used well especially. Although the heat-sealing film of this invention carries out the laminating of a base material layer and the heat-sealing layer, its co-extrusion forming-membranes method by two or more sets of extruders is [ the laminating approach ] the most practical. The approach of laminating the approach of carrying out the melting extrusion lamination of the heat-sealing layer, the base material layer which formed membranes beforehand, and a heat-sealing layer through adhesives in the base material layer which otherwise formed membranes beforehand etc. is raised.

[0099] The metal or the metallic oxide may be vapor-deposited by the base material layer, printing may be performed, and two or more sorts of those processings may be carried out.

[0100] The extrusion membrane formation approach of the base material layer of a heat-sealing film or a heat-sealing layer and its condition are described. A lactic-acid system polymer has high hygroscopicity, generally, since hydrolysis nature is also strong, moisture management is required, and to carry out



extrusion molding using a common single screw extruder, it is necessary to absorb moisture and dry polylactic acid or a lactic-acid system polyester constituent by a vacuum dryer etc. before membrane formation. Moreover, since the dehydration effectiveness can skip a desiccation process highly, efficient membrane formation is possible for the membrane formation by the vent type biaxial extruder.

[0101] Although especially the melting extrusion temperature at the time of forming polylactic acid or a lactic-acid system polyester constituent is not restricted, the range of it is usually 150-250 degrees C. The sheet by which melting extrusion was carried out is cast so that it may become predetermined thickness, and it is cooled by the need. In that case, a touch roll, the Ayr knife, and when thin [ sheet thickness is thick and ], it considers as a uniform film and a sheet by using electrostatic pinning properly. Although it is set to 0.2-3.0mm, if spacing of the lip which performs melting extrusion considers membrane formation nature, its 0.2-1.5mm will be desirable.

[0102] Next, concrete explanation about the laminating approach is given. As the production approach of the heat-sealing film by co-extrusion membrane formation, melting and kneading of a base material layer and a heat-sealing layer are done with a separate extruder, a laminating is carried out within a T die or the feed block before it etc., and membranes are formed through a T die. The extrusion membrane formation approach and conditions follow the place described previously fundamentally.

[0103] When the adhesive property of a base material layer and a heat-sealing layer is bad, you may have the glue line in the interlayer. As resin used for a glue line, the copolymer which introduced the special organic-functions machine, a butene system copolymer, polyethyleneimine, a denaturation cellulose, etc. are good for polyolefine etc. As thickness of a glue line, the range of 0.5-20 micrometers is desirable.

[0104] A melting extrusion lamination is the approach of pasting up a \*\*\*\*\* heat-sealing layer on the T die for laminators with a laminator, and laminating from the base material layer and extruder which were sent with the delivery machine. The extrusion membrane formation approach and conditions of a heat-sealing layer follow the place described previously fundamentally. When the adhesive property of a base material layer and a heat-sealing layer is bad, before sending a base material layer to a laminator, adhesive improvement can also be performed by surface irregularity processing of surface preparation, such as chemical etching processing of corona discharge treatment, frame plasma treatment, chromate treatment, etc., and ozone, ultraviolet treatment, sandblasting, etc. performing adhesive improvement, or choosing a suitable anchor coat agent.

[0105] A wet lamination, dry laminate, etc. are mentioned as the approach of the lamination which makes the base material layer made beforehand and a heat-sealing layer rival. In this case, it is necessary to laminate after applying adhesives to a base material layer or a heat-sealing layer. In a wet lamination, as adhesives, synthetic-resin molds, such as carbohydrate systems, such as protein systems, such as casein and gelatin, starch, and a cellulosic, vinyl acetate, acrylic ester, vinyl acetate of acrylic denaturation, and ethylene-vinyl acetate copolymerization resin, are mentioned.

[0106] The urethane system of the 2 liquid reaction type which mixes and uses base resin with the hydroxyl group of polyether system resin, such as polyester system resin, such as a 1 liquid reaction type which included the isocyanate radical in ends, such as polyether polyurethane poly isocyanate and polyester polyurethane poly isocyanate, as adhesives in the case of dry laminate, and polyester polyol, polyester polyurethane polyol, or polyether polyurethane polyol, and a curing agent with an isocyanate radical is mentioned. As coverage of these adhesives, about two 1 - 5 g/m is desirable.

[0107] The thermal resistance said by this invention means the practical thermal resistance which holds elasticity to some extent, and does not spoil an appearance or a film, a sheet, or its workpiece does not deform at the time of working temperature or use. If there is no temperature management also in the case of the usual transportation or storage in order to set workpieces, such as the bag and the case where a film, a sheet, or they were processed, and a lightweight container, in the sealing condition in a transport container and a warehouse etc., it is not rare to be exposed to ambient temperature 50 degrees C or more in summer. Therefore, the heat-resistant temperature beyond it is needed practically.

[0108] Although the lactic-acid system polyester constituent (A) used for a base material layer is crystallized in order to give thermal resistance, the heat setting method is explained as the heating art..



When performing a heat set, you may carry out by the base material layer independent which uses a lactic-acid system polyester constituent (A), and may carry out in the state of the laminating of a base material layer and a heat-sealing layer.

[0109] Although not limited about temperature and especially time amount, it is desirable to make whenever [ stoving temperature ] into the range under of the melting point ( $T_m$ ) from temperature lower 40 degrees C than the crystallization temperature ( $T_c$ ) of a lactic-acid system polyester constituent (A), for obtaining a proper crystallization rate. Especially, heat set temperature has especially the desirable range of temperature higher 40 degrees C than crystallization temperature ( $T_c$ ) to it, in order to obtain a good field condition and good thermal resistance.

[0110] Furthermore, if extension processing is performed before a heat set or to coincidence, it can crystallization speed up and thermal resistance can be improved by the short heating processing time for about 5 - 30 seconds. Furthermore, since this is accompanied by crystallization by orientation, it can improve thermal resistance, with the good transparency of a lactic-acid system polyester constituent held.

[0111] Although not restricted, immediately after especially this extension art carries out melting extrusion of the lactic-acid system polyester constituent, rolling, vertical uniaxial stretching, horizontal uniaxial stretching, coincidence biaxial stretching, or serial biaxial stretching performs it on the sheet after preservation. Moreover, extension processing may be performed by the base material layer independent which uses a lactic-acid system polyester constituent (A), and may be performed in the state of the laminating of a base material layer and a heat-sealing layer.

[0112] As conditions, although the glass transition temperature ( $T_g$ ) of a base material layer to under the melting point is desirable and a temperature requirement high 50 degrees C is more desirable than especially glass transition temperature ( $T_g$ ) from glass transition temperature, the field condition of a sheet is [ whenever / stoving temperature / in this case ] desirable [ a temperature requirement higher 10-40 degrees C especially than the glass transition temperature ( $T_g$ ) of a base material layer ] especially from a good thing. Although a field condition and transparency are good in the range it is 1.4 to 16 times whose field scale factor of this as draw magnification, the 2 to 16 times as many range as this is still more desirable.

[0113] The approach of making carry out fixed time amount contact on the approach of carrying out fixed time amount heating or a hot platen, metal mold, and a roll, and heating with radiant heat, such as air which carried out the forced convection, or an infrared heater, is mentioned to the heat set approach. The approach of using the equipment called especially a tenter can carry out the forced convection of the heated air, can perform a heat set on a sheet or a film continuously, and is excellent in productivity. Since this equipment is equipment aiming at extension processing, it can do extension and a heat set for a short time, and is excellent in productivity. Crystallization of a heat-sealing film can be advanced efficiently.

[0114] Moreover, the heat set in the case of fabricating in the lightweight container which packs contents, such as food, a drink, a chemical, and miscellaneous goods, with rigidity for a heat-sealing film by the hot-forming approaches, such as a vacuum forming, vacuum pressure sky shaping, hot-platen pressure forming, and a deep-drawing vacuum forming, is good to carry out on the metal mold to fabricate. Although especially the die temperature and time amount that become a heat set condition at this time are not limited, they are chosen from the heat set temperature described previously.

[0115] It is, in using at ordinary homes, and the heat-sealing film of this invention has the satisfactory thermal resistance of 60 degrees C or more, and is the examining method (JIS- K-7198, A law) about the temperature dependence of dynamic viscoelasticity, and the minimum value of the storage modulus ( $E'$ ) below temperature lower 20 degrees C than the melting point of a lactic-acid system polyester constituent (A) is 40 or more MPas.

[0116] When the storage modulus ( $E'$ ) was smaller than 40MPa(s), good elasticity cannot be acquired at 50-60 degrees C but contents are in a container, deformation is produced according to the load and contents are not supported. When the flexibility at the time of ordinary temperature use is also taken into consideration, as for a storage modulus ( $E'$ ), it is desirable to adjust in the range of a maximum of 4,000

MPa. Furthermore, when acquiring the heat-resistant high temperature of 80 degrees C or more, as for a storage modulus ( $E'$ ), it is more desirable to make it 90 or more MPas.

[0117] The trial about the temperature dependence of this dynamic viscoelasticity is performed by part for programming-rate/of 2 degrees C. The glass transition temperature ( $T_g$ ) said by this invention, crystallization temperature ( $T_c$ ), and the melting point ( $T_m$ ) are  $T_g(s)$ ,  $T_{pc}(s)$ , and  $T_{pm}(s)$  which are specified to JIS-K -7121, and perform a programming rate by part for 10-degree-C/. JIS-K-7121 are used for the lactic-acid system polymer of the amorphism nature said here, and it points out what the peak of the melting point is not accepted in. Measurement of softening temperature is performed by JIS-K -7206 and A law.

[0118] Moreover, the heat-sealing film of this invention shows the outstanding shock resistance originating in the lactic-acid system polyester constituent used for a base material layer or a heat-sealing layer. For example, the laminated film which consists of 250 micrometers of base material layers and 15 micrometers of heat-sealing layers is the thing which is not extended [ extension or ], more than 0.2J, it has the E. I. du Pont de Nemours impact strength which was preferably excellent in 0.3-5J, or what carried out the extension heat set presents preferably the film impact which was excellent in 1-10J more than 1J.

[0119] Furthermore, the heat-sealing film of this invention shows the outstanding flexibility originating in the lactic-acid system polyester constituent used for a base material layer or a heat-sealing layer. For example, the laminated film which consists of 250 micrometers of base material layers and 15 micrometers of heat-sealing layers shows the range of 0.5-3.0GPa, and the storage modulus ( $E'$ ) which was more preferably excellent in the range of 0.6-2.4GPa at a room temperature with the measuring method based on JIS-K -7198 and A law.

[0120] Since the heat-sealing film of this invention originates in the polylactic acid or the lactic-acid system polyester constituent used for the lactic-acid system polyester constituent or heat-sealing layer used for a base material layer, presents the outstanding bleed out depressor effect and has especially the bleed out depressor effect which was excellent even if it was an oriented film or a sheet, it is desirable. For example, when no extending [ of 10x10cm square and 250-micrometer thickness ] and a 35-micrometer extension sheet are left in 35 degrees C and the thermo hygostat of 80% of humidity, a bleeding object will not appear 60 days or-more from this mold-goods front face.

[0121] The seal reinforcement which was excellent when the heat-sealing film of this invention made the heat-sealing layer of each other a sealing surface is obtained. Moreover, the effective seal reinforcement also as a sealing surface is obtained in a base material layer and a heat-sealing layer. for example, the measured value to which the seal reinforcement after thermal melting arrival was based on JIS-Z -1710 -- it is -- a minimum -- 1N / 15mm or more -- desirable -- 2Ns / 15mm or more -- more -- desirable -- 4 -- they are 8Ns / 15mm or more still more preferably N/15mm or more. Although especially an upper limit is not limited, it is [ mm ] 15Ns/mm or less preferably 50Ns/or less. For example, although 4-8N / about 15mm are required of the field as which the comparatively weak seal reinforcement called an easy opening seal is required and the reinforcement of 8Ns / 15mm or more is required also of the field as which further comparatively strong seal reinforcement is required, the heat-sealing film of this invention can be used in the demand characteristics of these versatility, and a field.

[0122] The temperature (seal initiation temperature) to which the thermal melting arrival of the heat-sealing film of this invention becomes possible is near 80 degree C. Good seal reinforcement is obtained by carrying out thermal melting arrival at the temperature beyond this.

[0123] Moreover, the heat-sealing film which consists of a lactic-acid system polymer layered product in which the thermal melting arrival of this invention is possible can be used for the container with which general thermal resistance is demanded, and fits the package bag aiming at a package or receipt, a case, and the manufacture of a lightweight container that comes to carry out thermoforming especially as a container.

[0124] It is the bag generally used, and a package bag is what carried out the seal of the synthetic-resin film by approaches, such as bending or adhesion, and is a three-dimensional packing-material gestalt here depending on superficial and the case. Although there are food, such as vegetables, confectionery,

and a pan, miscellaneous goods or rice, fertilizer, etc. as an object of the package which used this, the heat-sealing film obtained here can be used for each [ these ] application as a package bag which bends or it comes to carry out thermal melting arrival.

[0125] a case -- bending processing of a sheet etc. -- box-like etc. -- or it is the three-dimensional packing material produced without processing it in three dimensions in the shape of a cylinder without bending and processing it, pasting up an edge by thermal melting arrival etc. depending on the case and being based on thermoforming, such as a vacuum forming and pressure forming. the object of the package which used this -- carrying out -- there are cosmetics, stationery, a small electrical-and-electric-equipment product, a toy, miscellaneous goods, etc.

[0126] Moreover, there are some which contain superficially the document which opened the two way type which bends one side as another gestalt called case, carries out thermal melting arrival of other end faces, or carries out a two way type thermal melting arrival, and remains wide. The heat-sealing film obtained here can be used for each [ these ] application as a case which bends or it comes to carry out thermal melting arrival.

[0127] A lightweight container is a packing material fabricated in three dimensions using the thermoforming approaches, such as a vacuum forming, vacuum pressure sky shaping, hot-platen pressure forming, or a deep-drawing vacuum forming, in a film or a sheet. There is a cup filled up with a body, a lid, a tray or a hood pack, a blister pack, PTP, and a liquid according to the gestalt. As an object packed by the lightweight container, there are chemicals, such as drinks, such as food with which it is filled up, such as solid food, such as vegetables, meat, a daily dish, confectionery, a pan, and deep-fried dishes, or jelly, a jam, and a pudding, dairy products, and juice, and a tablet, miscellaneous goods, etc.

[0128] The heat-sealing film obtained by this invention has the outstanding thermal melting arrival nature and everyday thermal resistance, and they can be used for it suitable for the packing material aiming at a package or receipt of various kinds of food, a drink, a chemical, miscellaneous goods, etc. especially a bag, a case, and the lightweight container that comes to carry out thermoforming.

[0129]

[Example] Although an example explains this invention to a detail, this invention is not limited to these. As long as there is no notice especially among an example, the "weight section" and "% of the weight" shall be meant the "section" and "%."

[0130] Each measurement and evaluation in this example were performed by the following approach.

(1) Measurement of seal on-the-strength seal reinforcement doubled mutually the heat-sealing layer of the obtained laminated film of two sheets, was made into the sealing surface, and carried out thermal melting arrival by the heat sealer (product made from circuit tester industry). Then, 180-degree friction test was carried out with the tension tester (Shimadzu Corp. make), and the bond strength of the thermal melting arrival by the heat-sealing method was measured as seal reinforcement.

[0131] However, seal conditions were performed in the seal bar temperature of 60-140 degrees C, seal \*\* 2 kgf/cm<sup>2</sup> (1.9x10<sup>5</sup>Pa), and seal time amount 1 second (the used silver dimension is 10x300mm). Seal measurement on the strength was measured by the approach based on JIS-Z-1707.

[0132] (2) Evaluation of heat-resistant thermal resistance was performed as follows. That is, the obtained laminated film was cut down in the magnitude of 20cm around, 300g weight was placed in the center, four corners were together banded so that it might be wrapped, and the simple trial bag was produced. Suspension of this was carried out so that a union part might turn up into the air oven (60 degrees C and 80 degrees C) of each test temperature, and the condition of the film under the effect of the weight of 20 minutes after was observed. The die length of the trial bag at the time of suspension was adjusted so that it might be set to 13.5cm. What especially change was not regarded as is O (the die length of a trial bag is a less than 14cm thing). The thing (that to which the die length of a trial bag exceeds 15cm) which developed remarkably with weight and deformed, or the thing to which bag tearing was carried out and weight fell is x. The condition in the meantime was evaluated as \*\*.

[0133] (3) Measurement of a storage-modulus storage modulus (E') calculated the value using JIS-K-7198 and A law from measurement with a storage modulus [ in temperature lower 20 degrees C than the melting point of a crystalline lactic-acid system polymer (A) ] (E'), or a storage modulus (E') of 20

degrees C.

(4) Evaluation of transparency transparency was performed in quest of the Hayes value by the approach based on JIS-K -7105.

(5) The melting point of thermal physical-properties resin, glass transition temperature, and crystallization temperature were searched for by the approach based on JIS-K -7121. It asked for the softening temperature of resin by the approach based on JIS-K -7206.

(6) Evaluation of biodegradability biodegradability was performed as follows. That is, 5kg of kitchen garbages was put into outdoor compost (capacity of 100l.), and the test piece of 10cm around started from the laminated film obtained on it was placed. Viewing estimated the condition of the test piece one month after carrying a kitchen garbage with a thickness of about 5 morecm. In addition, this trial was performed in the summer. A valuation basis is as follows. There is degradation of physical properties remarkably and it is O which has difficult maintenance of a configuration. It is \*\* which is maintaining the configuration although there are deformation and milkiness. What there are not milkiness, deformation, etc. and is maintaining the condition before test initiation was taken as x.

[0134] (7) Using the E. I. du Pont de Nemours impact strength measuring method of impact strength evaluation JIS-K -5400, the height of the weight of fixed weight is changed, and was dropped at equal intervals, and it asked for 50% breaking energy of the sheet obtained by the existence of destruction. The part which \*\*\*\* a sheet is steel and used the thing of the smooth shape of a semi-sphere with a radius of 6.3mm. (The E. I. du Pont de Nemours impact tester by the UESHIMA factory company is used).

(8) Measurement of bleed out nature bleed out nature was left in thermo-hygrostat PR[ by Tabai Espec Corp. ]-2F which maintained the film or the sheet at 35 degrees C and the humidity of 80 degrees C. The condition of a film was observed every day and the days from which bleed out begins estimated.

[0135] Heating churning was carried out teach the propylene glycol of the 1.35-mol equivalent to 1L flask which attached a <example of manufacture> (example 1 of manufacture; production of polyester unit (b-1)) stirrer, a rectifier, and gas installation tubing to the mol equivalent of the 100 weight sections and dicarboxylic acid, and make the temperature up of the 10 degrees C of the sebacic acids carry out to it in each 1 hour from 150 degrees C under a nitrogen air current.

[0136] The temperature up was carried out to 220 degrees C, distilling off the water to generate, 80 ppm of titanium tetra-butoxide monomers were added as an ester interchange catalyst 1 hour after, and it decompressed to 0.1KPa, and agitated for 6 hours. Consequently, aliphatic series polyester (b-1) was obtained as a polyester unit. Gel par EMISHON chromatography (it abbreviates to GPC.) the TOSOH CORP. make -- HLC-8020, the column temperature of 40 degrees C, and tetra-GIDORO furan solvent use. It is below the same. As a result of measuring, the number average molecular weight of this polymer was 28,000, and weight average molecular weight was 52,000.

[0137] (the example 2 of manufacture; production of a polyester unit (b-2)) heating churning be carried out, teach the propylene glycol of the 1.35-mol equivalent to 1L flask which attached a stirrer, a rectifier, and gas installation tubing to the mol equivalent of the succinic acid (it abbreviate to SuA hereafter.) 100 weight section, and dicarboxylic acid, and make the temperature up of the 10 degrees C carry out to it in each 1 hour from 150 degrees C under a nitrogen air current. 4 chlorination hafnium 70ppm were added and agitated after the temperature up to 220 degrees C, distilling off the water to generate. 3 hours after, it decompressed to 0.1KPa and agitated for 6 hours, and the number average molecular weight (Mn) by the polystyrene conversion using GPC obtained 20,000, and weight average molecular weight (Mw) obtained aliphatic series polyester (b-2) as a polyester unit of 30,000.

[0138] (The example 3 of manufacture; lactic-acid system polyester (A1-1), production of (A1-2)) The toluene 10 weight section was taken to the separable flask to the total quantity of 50 weight sections, the L-lactide 50 weight section and lactide, and each polyester about each (b-2) aliphatic series polyester (b-1) produced previously, and it fused at 180 degrees C. After the solution became homogeneity, octanoic-acid tin 300ppm were added, and it agitated at 180 degrees C for 2.5 hours.

[0139] 600 ppm of ethylhexanoic acid phosphate were added after polymerization termination, and reduced pressure, 1-hour churning, and residual lactide were removed to 0.5KPa. The lactic-acid system

polyester (A1-2) with which the lactic-acid system polyester (A1-1) obtained from aliphatic series polyester (b-1) was obtained from aliphatic series polyester (b-2) by GPC number average molecular weight 33,000, weight average molecular weight 57,000, and glass-transition-temperature (T<sub>g</sub>) 53 degree was number average molecular weight 24000 and weight-average-molecular-weight 36,000 glass-transition-temperature (T<sub>g</sub>) 57 degree C in GPC.

[0140] (The example 4 of manufacture; lactic-acid system polyester (B1-1), production of (B1-2)) The toluene 10 weight section was taken to the separable flask to the total quantity of 50 weight sections, the L-lactide 45 weight section and the D-lactide 5 weight section and these lactide, and each polyester about each (b-2) aliphatic series polyester (b-1) produced previously, and it fused at 180 degrees C. After the solution became homogeneity, octanoic-acid tin 300ppm were added, and it agitated at 180 degrees C for 2.5 hours. 600 ppm of ethylhexanoic acid phosphate were added after polymerization termination, and reduced pressure, 1-hour churning, and residual lactide were removed to 0.5KPa. The lactic-acid system polyester (B1-2) with which the lactic-acid system polyester (B1-1) obtained from aliphatic series polyester (b-1) was obtained from number average molecular weight 33,000, weight average molecular weight 57,000, and aliphatic series polyester (b-2) by GPC was number average molecular weight 24000 and weight average molecular weight 36,000 in GPC.

[0141] (The example 5 of manufacture; production of polylactic acid (P1)) The 0.02 weight section, in addition a 8-hour reaction were performed [ L-lactide ] for tin octanoate as an esterification catalyst after 1-hour churning under conditions with a temperature of 185 degrees C among the inert gas ambient atmosphere. Then, the alkyl-acid-phosphate 0.04 weight section was added and kneaded as a quencher. The obtained polylactic acid (P1 is called hereafter) was transparent and colorless resin, and, for weight average molecular weight, 250,000 and glass transition temperature (T<sub>g</sub>) were [ 110 degrees C and the melting point (T<sub>m</sub>) of 59 degrees C and crystallization temperature (T<sub>c</sub>) ] 176 degrees C from the measurement result of GPC.

[0142] (The example 6 of manufacture; production of polylactic acid (P2)) The 0.02 weight section, in addition a 8-hour reaction were performed [ L-lactide 70 mol % and D-lactide 30 mol % ] for tin octanoate as an esterification catalyst after 1-hour churning under conditions with a temperature of 165 degrees C among the inert gas ambient atmosphere. Then, the alkyl-acid-phosphate 0.04 weight section was added and kneaded as a quencher. The obtained polylactic acid (P2 is called hereafter) was transparent and colorless resin, 270,000 was not seen for weight average molecular weight from the measurement result of GPC, and 52 degrees C and the melting point (T<sub>m</sub>) were not seen for glass transition temperature (T<sub>g</sub>).

[0143] The following evaluation trial was performed about the monolayer sheet or film which consists of a lactic-acid system polyester constituent (A) used as a base material layer of the heat-sealing film of <example of reference> (example 1 of reference) this invention, and this constituent (A).

[0144] (Evaluation of a lactic-acid system polyester constituent (A)) The lactic-acid system polyester constituent (A) which carries out heating reduced pressure drying of the polylactic acid (PLA is called) shown in Table 1 and the lactic-acid system polyester (A1-1) obtained in the example 1 of manufacture for 6 hours, and contains it at 100 degrees C was obtained. Glass transition temperature, the melting point, the storage modulus (E') in 20 degrees C, and IZOD impact strength were measured, and the result was collectively shown in Table 1.

[0145] (The E. I. du Pont de Nemours impact resistance value of a film, evaluation of bleed out nature) The lactic-acid system polyester constituent (A) which carries out heating reduced pressure drying of the polylactic acid (PLA is called) and lactic-acid system polyester (A1-1) which were shown in Table 1 for 6 hours, and contains them at 100 degrees C was obtained. This constituent was pressed for 1 minute by the pressure of 20MPa(s), having inserted the PET sheet with a \*\*\*\*\* thickness of 250 micrometers for 3.3g and a 10cmx10cm square with the PET sheet with a thickness of 100 micrometers, and carrying out heating fusion at 190 degrees C. The obtained film was covered over the water-cooled press machine for 10 minutes, the film which consists of this constituent was taken out, and it was left in the room temperature for 24 hours. Obtained 10cmx10cm, the E. I. du Pont de Nemours impact resistance value of a film with a thickness of 250 micrometers, and bleed out nature were measured. The

result is shown in Table 1.

[0146] (Biaxial extension heat set film production) The lactic-acid system polyester constituent (A) which carries out heating reduced pressure drying of the polylactic acid (PLA is called) and lactic-acid system polyester (A1-1) which were shown in Table 1 for 6 hours, and contains them at 100 degrees C was obtained. After pressing this constituent for 3 minutes on condition that 195 degrees C and 5MPa with a small heat press, After performing quenching and producing 200-micrometer film (12cm long, 12cm wide), between chucks is set to 10cm using biaxial-stretching equipment (made in the Iwamoto factory). Serially by 10mm/second in 60 degrees C of extension temperature conditions, and extension rate by extension 140 degrees C carried out the heat set for 50 seconds after extension and in air oven by 2.5 times of the lengthwise direction and longitudinal direction said scale factor, and the biaxial extension heat set film with a thickness of about 35 micrometers was obtained. Thus, about the obtained biaxial extension heat set film, the E. I. du Pont de Nemours impact resistance value and bleed out nature were measured. The result was collectively shown in Table 1.

[0147] (Example 1 of comparison reference) The same evaluation of each as the example 1 of reference and a measurement trial were performed using polylactic acid (P1).

[0148] (Example 2 of comparison reference) the L-lactide 100 weight section -- receiving -- aliphatic series system polyester (weight average molecular weight: 35,000) and 50 mol % and the propylene glycol 50 mol % 10 weight section of sebacic acids -- in addition, inert gas permuted the ambient atmosphere, it was made to mix at 170 degrees C for 1 hour, the tin octanoate 0.02 weight section was added as an esterification catalyst, and the reaction was performed for 8 hours. Then, the alkyl-acid-phosphate 0.04 weight section was added and kneaded as a quencher, and the polymer (A') was obtained. For the weight average molecular weight of the obtained polymer (A'), 110,000 and glass transition temperature (Tg) were [ 93 degrees C and the melting point (Tm) of 49 degrees C and crystallization temperature (Tc) ] 162 degrees C from the measurement result of GPC. The evaluation of each same about this polymer (A') as the example 1 of reference and a measurement trial were performed.

[0149]

[Table 1]



		参考例 1	比較参考例 1	比較参考例 2
ポリ乳酸	ポリ乳酸名	P 1	P 1	—
	分子量(M <sub>w</sub> )(万)	2 5	2 5	—
	分子量(M <sub>n</sub> )(万)	1 6	1 6	—
	仕込量 (重量部)	1 0 0	1 0 0	0
乳酸系ポリエステル	分子量(M <sub>w</sub> )(万)	5 . 7	—	1 1
	分子量(M <sub>n</sub> )(万)	3 . 3	—	6 . 4
	仕込量 (重量部)	1 0	0	1 0 0
組成物、 又はポリマー	T <sub>g</sub> (°C)	5 3	6 0	5 5
	m <sub>p</sub> (°C)	1 7 2	1 7 5	1 6 8
	貯蔵弾性率(GPa)20°C	2 . 2	3 . 5	2 . 1
	IZOD 衝撃強度(KJ/m <sup>2</sup> )	1 5 . 1	2 . 0	2 . 2
250 μm	デュポン衝撃値 (J)	0 . 4 8	0 . 1 0	0 . 1 5
フィルム	ブリード開始日数	1年以上	1年以上	6ヶ月
35 μm 2軸延伸	フィルムインパクト(J)	3	0 . 7	2
伸熱セットフィルム	貯蔵弾性率(GPa)20°C	2 . 7	3 . 5	2 . 1
	ブリード開始日数	1年以上	—	2日

[0150] < example; The lactic-acid system polyester constituent containing the polylactic acid (PLA is called) used as a base material layer shown in the production > (examples 1 and 2) table 2 of a heat-sealing film, and lactic-acid system polyester (A1) (A), The lactic-acid system polyester constituent (B) containing the polylactic acid used as a heat-sealing layer shown in Table 2 or polylactic acid, and lactic-acid system polyester (B1) was respectively blended using the drum tumbler at a rate shown in Table 2, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, the lactic-acid system polyester constituent (B) which contains polylactic acid (PLA is called) or polylactic acid, and lactic-acid system polyester (B1) in a base material layer for the blend desiccation resin used as lactic-acid system polyester (A) was used as the heat-sealing layer, and extrusion membrane formation of a base material layer (20 micrometers) and the laminated film with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 35 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make).

[0151] The heat set for 10 minutes was performed on the film in 100-degree C air oven after that. The next evaluation was carried out in the obtained laminated film. Each measurement result of the storage modulus (E') in 20 degrees C or less, transparency, biodegradability, and bleed out nature is shown in Table 2 from the thermal physical-properties value of the obtained laminated film, seal reinforcement, thermal resistance, and the melting point.

[0152] Seal initiation temperature is near 80 degree C, and each laminated film presented the good seal reinforcement of 10Ns / 15mm or more in 90 degrees C or more. About thermal resistance, it was good



in the real trial which used weight at the test temperature of 60 degrees C and 80 degrees C. At this time, the minimum value of the storage modulus (E') of each laminated film is 90 or more MPas. Moreover, the produced heat-sealing film was transparency and biodegradability was good.

[0153] (Example 3) The lactic-acid system polyester constituent (A) containing the produced polylactic acid (PLA is called) which is shown in Table 2 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 2, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of the laminating sheet with a thickness of 140 micrometers which has the configuration of a base material layer (80 micrometers) and a heat-sealing layer (60 micrometers) using a co-extrusion machine (the Tanabe plastics company make) was carried out so that it might become a heat-sealing layer in a lactic-acid system polyester constituent (A) about the lactic-acid system polyester constituent (B) of a base material layer and amorphism nature.

[0154] next, the 35-micrometer oriented film was produced by the single-engined biaxial drawing machine (the Iwamoto factory company make) for the extension temperature of 70 degrees C, and preheating-time 5 minutes on condition that the part [ for /], and 100% draw magnification 2of extension rates x2(vertical x width): side scale factor 4. On both sides of the film, it fixed to the frame after that, and the heat set for 20 seconds was performed in 100-degree C air oven.

[0155] Each measurement result of the storage modulus (E') in temperature lower 20 degrees C than the thermal physical properties of the obtained laminated film, seal reinforcement, thermal resistance, and the melting point, transparency, biodegradability, and bleed out nature is shown in Table 2. The seal initiation temperature of the produced laminated film is near 80 degree C, and presented the good seal reinforcement of 10Ns / 15mm in 90 degrees C or more. About thermal resistance, it was satisfactory in the real trial which used weight at the test temperature of 60 degrees C and 80 degrees C. The transparency of a film and biodegradability were good.

[0156] (Example 4) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 3 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 3, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of two sorts of each monolayer films with a thickness of 25 micrometers was carried out using the extruder (the Tanabe plastics company make) so that it might become a base material layer with a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0157] The heat set only of the monolayer film which consists of a lactic-acid system polyester constituent (A) here was carried out for 10 minutes in 100-degree C air oven. Then, desiccation was performed, after applying the gelatin solution to one side of these two sorts of films 30%, respectively and being stuck by pressure by 0.2MPa. Consequently, the good laminated film of an appearance was obtained. Each measurement result of the storage modulus (E') in temperature lower 20 degrees C than the thermal physical properties of the obtained laminated film, seal reinforcement, thermal resistance, and the melting point, transparency, biodegradability, and bleed out nature is shown in Table 3.

[0158] Seal initiation temperature is near 80 degree C, and the produced laminated film presented the good seal reinforcement of 10Ns / 15mm in 90 degrees C or more. About thermal resistance, it was satisfactory in the real trial which used weight at the test temperature of 60 degrees C and 80 degrees C. The minimum value of the storage modulus (E') of a laminated film was 90 or more MPas. The transparency of a film and biodegradability were good.

[0159] (Example 5) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 3 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 3, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, the heat-sealing layer (15 micrometers) was

formed in both sides of a base material layer (20 micrometers) using the co-extrusion machine (the Tanabe plastics company make), and extrusion membrane formation of the 50-micrometer laminated film was carried out so that it might become a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A) at a base material layer. then, this film -- the inside of 100-degree C air oven -- the heat set for 10 minutes -- it carried out. The storage modulus (E') in temperature lower 20 degrees C than the thermal physical-properties value of the obtained laminated film, seal reinforcement, thermal resistance, and the melting point, transparency, biodegradability, and bleed out nature were measured. A result is shown in Table 3.

[0160] The seal initiation temperature of the film concerned is near 80 degree C, and has good seal reinforcement in 90 degrees C or more. About heat-resistant evaluation, it was satisfactory in the real trial which used weight. The transparency of a film and biodegradability were good.

[0161] (Example 6) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 4 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 4, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of a base material layer (20 micrometers) and the laminated film with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 35 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make) so that it might become a base material layer with a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0162] The heat set was performed for the film for 10 minutes in 100-degree C air oven after that. The end of the laminated film obtained considering the heat-sealing layer as an inside of a package bag was turned up here, and the bottom part of a package bag was formed. Next, the package bag of 20cm around which heat sealed the both sides of a part using the heat sealer (product made from circuit tester industry) by return, and the method of one opened wide was produced. The appearance of the produced package bag is good. The seal reinforcement of the methods of two which carried out the seal was also good. Seal conditions were performed in the seal bar temperature of 90 degrees C, seal \*\* 0.2MPa, and seal time amount 1 second (the used silver dimension is 10x300mm).

[0163] Each measurement result of the thermal resistance of the obtained laminated film, the storage modulus (E') in temperature lower 20 degrees C than the melting point, transparency, biodegradability, and bleed out nature is shown in Table 4. Especially deformation and a tear were not looked at by the package bag in heat-resistant evaluation of the laminated film of this invention. Biodegradability was good although biodegradability evaluation was similarly estimated as the approach performed in the examples 1 and 2 by using as a test piece the package bag in which the kitchen garbage was put.

[0164] (Example 7) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 4 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 4, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of a base material layer (20 micrometers) and the laminated film with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 35 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make) so that it might become a base material layer with a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0165] The heat set of the film was carried out for 10 minutes in 100-degree C air oven after that. The end of the laminated film obtained considering the heat-sealing layer as an inside of a package bag here was turned up, and the bottom part of a package bag was formed. Next, the package bag of 20cm around which carried out the fusing seal of the both sides of a part by return, and the method of one opened wide was produced. The appearance of the produced package bag was good and was good. [ of the seal reinforcement of the methods of two which carried out the seal ] Seal conditions were performed at the

seal bar temperature of 300 degrees C.

[0166] Each measurement of the thermal resistance of the obtained laminated film, the storage modulus (E') in temperature lower 20 degrees C than the melting point, transparency, biodegradability, and bleed out nature was performed. A result is shown in Table 4. Thermal resistance is [ especially no deformation and tear ] in a package bag and was good. Biodegradability was good although biodegradability evaluation was similarly estimated as the approach performed in the examples 1 and 2 by using as a test piece the package bag in which the kitchen garbage was put.

[0167] (Example 8) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 4 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 4, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of a base material layer (20 micrometers) and the laminating sheet with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 35 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make) so that it might become a base material layer with a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0168] The heat set was carried out to the sheet for 10 minutes in 100-degree C air oven after that. The end of the laminated film obtained considering the heat-sealing layer as an inside of a package bag here was turned up, and the bottom part of a package bag was formed. Next, the package bag of 20cm around which carried out impulse heat sealing of the both sides of a part by return, and the method of one opened wide was produced.

[0169] The appearance of the produced package bag is good. The seal reinforcement of the methods of two which carried out the seal was also good. The sealing machine used the Fuji poly sealer.

[0170] Each measurement result of the thermal resistance of the obtained laminated film, the storage modulus (E') in temperature lower 20 degrees C than the melting point, transparency, biodegradability, and bleed out nature is shown in Table 4. Especially deformation and a tear were not looked at for thermal resistance by the package bag. Biodegradability was good although biodegradability evaluation was similarly estimated as the approach performed in the examples 1 and 2 by using as a test piece the package bag in which the kitchen garbage was put.

[0171] (Example 9) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 4 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 4, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of a base material layer (100 micrometers) and the laminating sheet with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 115 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make) so that it might become a base material layer with a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0172] an after that film -- the inside of 100-degree C air oven -- the heat set for 10 minutes -- it carried out. The laminating sheet obtained considering the heat-sealing layer as an inside of a case here was rounded off so that it might become a cylinder, superposition heat sealing of the both ends was carried out, and the side-face part of a cylinder-like case was produced. Cylindrical height is 10cm and a diameter is 5cm. The appearance of the seal part of the produced case side face is good. Seal reinforcement was also good. Seal conditions were performed in the seal bar temperature of 100 degrees C, seal \*\* 0.2MPa, and seal time amount 1 second.

[0173] Each measurement of the thermal resistance of the obtained laminated film, the storage modulus (E') in temperature lower 20 degrees C than the melting point, transparency, biodegradability, and bleed out nature was performed. A result is shown in Table 4. However, thermal resistance stood the produced cylindrical case perpendicularly in the air oven (60 degrees C and 80 degrees C) of each test

temperature, set it for 20 minutes, and was performed. Contraction, deformation, etc. were not especially seen. Biodegradability was good although biodegradability evaluation was similarly estimated as the approach performed in the examples 1 and 2 by using as a test piece the case in which the kitchen garbage was put.

[0174] (Example 10) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 4 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were blended using the drum tumbler at a rate respectively shown in Table 4, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of a base material layer (250 micrometers) and the laminating sheet for vacuum formings with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 265 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make) so that it might become a base material layer with a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0175] Moreover, extrusion membrane formation of 20 micrometers of base material layers and the laminated film for seals with a thickness [ of 15 micrometer configuration of heat-sealing layers ] of 35 micrometers was carried out similarly. The film carried out the heat set for 10 minutes in 100-degree C air oven after that. In addition, impact strength evaluation was performed about the laminating sheet for vacuum formings. The impact resistance value of the laminating sheet for vacuum formings was 0.35J, and was good.

[0176] The contraction ratio performed the vacuum forming with the cup metal mold of 0.36 (female mold) by the round shape whose diameter of opening is 55mm, and the sheet fabricated it in the lightweight container for evaluation. The heat-sealing layer was made into the container inside at this time, and width of face of the flange of the mold goods equivalent to a seal part was set to 3mm. Vacuum-forming conditions were performed in die-temperature [ of 80 degrees C ], and cycle time 30 seconds for the heater temperature of 40 degrees C, and heating time 10 seconds.

[0177] Each measurement result of the thermal resistance of the obtained laminated film, the storage modulus (E') in temperature lower 20 degrees C than the melting point, transparency, biodegradability, and bleed out nature is shown in Table 4. However, in the produced cup, in the air oven (60 degrees C and 80 degrees C) of each test temperature, thermal resistance was set for 20 minutes and performed. Especially in 60 degrees C, although contraction, deformation, etc. were not seen, some deformation was seen at 80 degrees C. Evaluation is appearance evaluation (O: fitness, x:contraction, deformation of a \*\*:some). Next, the cup and the film for seals were heat sealed using the auto cup sealer (the Sunrise system company make) in the seal temperature of 100 degrees C, seal \*\* 0.2MPa, and seal time amount 1 second. The sealing surface was taken as the mutual heat-sealing layer. The seal reinforcement of the lightweight container which carried out the seal was good, and its appearance which carried out the seal was also good.

[0178] Biodegradability was good although biodegradability evaluation was similarly estimated as the approach which performed the test piece in the examples 1 and 2 as a lightweight container in which the kitchen garbage was put.

[0179]

[Table 2]

実施例		1	2	3
基材層	乳酸系ポリエステル(A1)	A1-1	A1-1	A1-2
	ポリ乳酸 100 部に対する乳酸系ポリエステル(A1)の添加量(部)	10	10	30
	ポリ乳酸	P1	P1	P1
	乳酸系ポリエステル組成物(A)の融点[°C]	175	175	174
	乳酸系ポリエステル組成物(A)の結晶化温度[°C]	110	110	110
ヒート シール 層	乳酸系ポリエステル(B1)	—	B1-1	B1-2
	ポリ乳酸 100 部に対する乳酸系ポリエステル(B1)の添加量(部)	—	10	30
	ポリ乳酸	P2	P2	P2
	乳酸系ポリエステル組成物(B)の軟化温度 [°C]	52	51	51
ヒート シール フィルム	厚み[μm]	35	35	35
	ヘイズ値[%]	5	5	3
	耐熱性	60°C	○	○
		80°C	○	○
	E' [MPa]	150	130	100
	生分解性	○	○	○
	シール強度 [N/15mm]	80°C	4	3
		90°C	7	6
		100°C	8	8
		120°C	10	9
		140°C	10	9
	ブリード開始日数	1 年 以上	1 年 以上	1 年 以上

[0180]  
[Table 3]

実施例		4	5
基材層	乳酸系ポリエステル(A1)	A1-2	A1-1
	ポリエステル 100 部に対する乳酸系ポリエステル(A1)の添加量(部)	30	10
	ポリエステル	P1	P1
	乳酸系ポリエステル組成物(A)の融点[°C]	174	175
	乳酸系ポリエステル組成物(A)の結晶化温度[°C]	110	110
ヒートシール層	乳酸系ポリエステル(B1)	B1-2	B1-1
	ポリエステル 100 部に対する乳酸系ポリエステル(B1)の添加量(部)	30	10
	ポリエステル	P2	P2
	乳酸系ポリエステル組成物(B)の軟化温度 [°C]	51	51
ヒートシールフィルム	厚み[μm]	52	50
	ヘイズ値[%]	4	7
	耐熱性	60°C	○
		80°C	○
	E' [MPa]	100	130
	生分解性	○	○
	シール強度 [N/15mm]	80°C	2
		90°C	7
		100°C	8
		120°C	10
		140°C	10
	ブリード開始日数	1 年 以上	1 年 以上

[0181]  
[Table 4]

実施例		6	7	8	9	10
基材層	乳酸系ポリエステル(A1)	A1-2	A1-2	A1-2	A1-1	A1-1
	ポリ乳酸 100 部に対する乳酸系ポリエステル(A1)の添加量(部)	30	30	30	10	10
	ポリ乳酸	P1	P1	P1	P1	P1
	乳酸系ポリエステル組成物(A)の融点[°C]	174	174	174	175	175
	乳酸系ポリエステル組成物(A)の結晶化温度[°C]	110	110	110	110	110
ヒート シール 層	乳酸系ポリエステル(B1)	B1-2	B1-2	B1-2	B1-1	B1-1
	ポリ乳酸 100 部に対する乳酸系ポリエステル(B1)の添加量(部)	30	10	30	10	10
	ポリ乳酸	P2	P2	P2	P2	P2
	乳酸系ポリエステル組成物(B)の軟化温度[°C]	52	52	52	51	51
ヒート シール フィルム	厚み[μm]	35	35	35	115	265
	ヘイズ値[%]	4	4	4	10	20
	耐熱性	60°C	○	○	○	○
		80°C	○	○	○	○
	E' [MPa]	100	100	100	130	130
	生分解性	○	○	○	○	○
ブリード開始日数		1 年 以上	1 年 以上	1 年 以上	1 年 以上	1 年 以上

[0182] (Examples 1 and 2 of a comparison) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 5 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were respectively blended using the drum tumbler at a rate respectively shown in Table 5, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. In this example of a comparison, extrusion membrane formation of a base material layer (20 micrometers) and the laminated film with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 35 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make), and the heat set of the membrane formation film was carried out for 10 minutes in 100-degree C air oven so that it might become a heat-sealing layer with a base material layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A). Measurement of seal reinforcement doubled mutually the heat-sealing layer of the obtained laminated



film of two sheets, and seal measurement on the strength made it the sealing surface, and carried out thermal melting arrival by the heat sealer (product made from circuit tester industry), and seal reinforcement was evaluated. Moreover, each measurement of thermal resistance, the storage-modulus ( $E'$ ) transparency in temperature lower 20 degrees C than the melting point, biodegradability, and bleed out was performed. The result is shown in Table 5. Seal reinforcement was not obtained about this film. [0183] (Example 3 of a comparison) The lactic-acid system polyester constituent (A) containing the polylactic acid (PLA is called) shown in Table 5 and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) were respectively blended using the drum tumbler at a rate respectively shown in Table 5, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. In this example of a comparison, extrusion membrane formation of a base material layer (80 micrometers) and the laminating sheet with a thickness [ of a heat-sealing layer (60 micrometers) configuration ] of 140 micrometers was carried out so that it might become a heat-sealing layer with a base material layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0184] next, the 35-micrometer extension laminated film was produced by the single-engined biaxial drawing machine (the Iwamoto factory company make) for the extension temperature of 70 degrees C, and preheating-time 5 minutes on condition that the part [ for /], and 100% draw magnification 2of extension rates x2(vertical x width): side scale factor 4. It fixed to the frame of 30cm angle on both sides of the film, and the heat set was carried out for 20 seconds in 100-degree C air oven.

[0185] Measurement of seal reinforcement doubled mutually the heat-sealing layer of the obtained laminated film of two sheets, and seal measurement on the strength made it the sealing surface, and carried out thermal melting arrival by the heat sealer (product made from circuit tester industry), and seal reinforcement was evaluated. Moreover, the storage modulus ( $E'$ ) in temperature lower 20 degrees C than thermal resistance and the melting point, transparency, biodegradability, and bleed out nature were evaluated. The result is shown in Table 5. As for this film, seal reinforcement was not obtained.

[0186]

[Table 5]

比較例		1	2	3
ヒートシール層	乳酸系ポリエステル(A1)	1	1	2
	ポリ乳酸 100 部に対する 乳酸系ポリエステル(A1)の添加量(部)	10	10	30
	ポリ乳酸	P1	P1	P1
	乳酸系ポリエステル(A)の融点[°C]	175	175	174
	乳酸系ポリエステル(A)の結晶化温度[°C]	110	110	110
基材層	乳酸系ポリエステル(B1)	—	1	2
	ポリ乳酸 100 部に対する 乳酸系ポリエステル(B1)の添加量(部)	—	10	30
	ポリ乳酸	P2	P2	P2
	乳酸系ポリエステル(B)の軟化温度[°C]	52	51	51
ヒートシールフィルム	厚み[μm]	35	35	35
	ヘイズ値[%]	5	5	3
	耐熱性	60°C	○	○
		80°C	○	○
	E' [MPa]		120	110
	生分解性		○	○
	シール強度	80°C	0	0
		90°C	0	0
		100°C	0	0
		120°C	0	0
		140°C	0	0
	ブリード開始日数		1年以上	1年以上

[0187] (Example 4 of a comparison) The lactic-acid system polyester constituent (A) containing polylactic acid (PLA is called) and lactic-acid system polyester (A1) and the lactic-acid system polyester constituent (B) containing polylactic acid and lactic-acid system polyester (B1) which are shown in Table 6 were blended using the drum tumbler at a rate respectively shown in Table 6, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane

formation of a base material layer (20 micrometers) and the laminated film with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 35 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make) so that it might become a base material layer with a heat-sealing layer about the lactic-acid system polyester constituent (B) of amorphism nature in a lactic-acid system polyester constituent (A).

[0188] Then, the thermal resistance of the laminated film obtained without performing a heat set and transparency were measured. A result is shown in Table 4. About the thermal resistance of the produced laminated film, the tear was seen with the test temperature of 60 degrees C and 80 degrees C in the real trial which used weight. The minimum value of the storage modulus (E') in temperature lower 20 degrees C than the melting point of a laminated film is 0MPa, and there was no thermal resistance.

[0189] (Example 5 of a comparison) The resin used as a lactic-acid system polyester constituent (A) was blended with the produced polylactic acid (PLA is called) which is shown in Table 6 using the drum tumbler at a rate shown in Table 6 from lactic-acid system polyester (A1), and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, after carrying out extrusion membrane formation of the monolayer film with a thickness of 35 micrometers for a lactic-acid system polyester constituent (A) using an extruder (the Tanabe plastics company make), the heat set for 10 minutes was performed for the film in 100-degree C air oven.

[0190] The seal reinforcement of the obtained monolayer film, thermal resistance, and transparency were measured. A result is shown in Table 6. Heat-sealing reinforcement was not obtained.

[0191] (Example 6 of a comparison) The resin used as the lactic-acid system polyester constituent (B) of amorphism nature was blended using the drum tumbler at a rate shown in Table 6 from the polylactic acid (PLA is called) and lactic-acid system polyester (B1) which are shown in Table 6 and which were produced, and 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer. Then, extrusion membrane formation of the monolayer film with a thickness of 35 micrometers was carried out using the extruder (the Tanabe plastics company make), and the heat set for 10 minutes was performed for the film in 100-degree C air oven. The thermal resistance of the obtained monolayer film, transparency, biodegradability, and bleed out nature were measured. An evaluation result is shown in Table 6. About the thermal resistance of the laminated film produced here, the tear was seen with the test temperature of 60 degrees C and 80 degrees C in the real trial which used weight. The minimum value of the storage modulus (E') of a laminated film is 0MPa, and there was no thermal resistance.

[0192] (Example 7 of a comparison) the L-lactide 100 weight section -- receiving -- aliphatic series system polyester (weight average molecular weight: 35,000) and 50 mol % and the propylene glycol 50 mol % 10 weight section of sebacic acids -- in addition, inert gas permuted the ambient atmosphere, it was made to mix at 170 degrees C for 1 hour, the tin octanoate 0.02 weight section was added as an esterification catalyst, and the reaction was performed for 8 hours. Then, the alkyl-acid-phosphate 0.04 weight section was added and kneaded as a quencher, and the polymer (A') was obtained. For the weight average molecular weight of the obtained polymer (A'), 110,000 and glass transition temperature (Tg) were [ 93 degrees C and the melting point (Tm) of 49 degrees C and crystallization temperature (Tc) ] 162 degrees C from the measurement result of GPC. This polymer (A') is used as a base material layer.

[0193] lactide (L-lactide 90 weight section, D-lactide 10 weight section) -- receiving -- aliphatic series system polyester (weight average molecular weight: 35,000) and 50 mol % and the propylene glycol 50 mol % 10 weight section of sebacic acids -- in addition, inert gas permuted the ambient atmosphere, it was made to mix at 170 degrees C for 1 hour, the tin octanoate 0.02 weight section was added as an esterification catalyst, and the reaction was performed for 8 hours. Then, the alkyl-acid-phosphate 0.04 weight section was added and kneaded as a quencher, and the polymer (B') was obtained. 110,000 was not seen for the weight average molecular weight of the obtained polymer (B') from the measurement result of GPC, and 48 degrees C and the melting point (Tm) were not seen for glass transition temperature (Tg). This polymer (B') is used as a heat-sealing layer. 80 degrees C and the vacuum drying of 2 hours were performed using the vacuum dryer about each obtained polymer. Then, the polymer (A') was used as the base material layer, the polymer (B') of amorphism nature was used as the heat-sealing layer, and extrusion membrane formation of a base material layer (250 micrometers) and the laminating

sheet with a thickness [ of a heat-sealing layer (15 micrometers) configuration ] of 265 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make).

[0194] Impact strength evaluation was performed about this laminating sheet. It turned out that it is inferior to the sheet (0.35J) which an impact resistance value is 0.15J and was produced in the example 10.

[0195] (Example 8 of a comparison) 80 degrees C and the vacuum drying of 2 hours were performed for the polymer (A') and polymer (B') which were produced in the example 7 of a comparison using the vacuum dryer about each. Then, the polymer (A') was used as the base material layer, the polymer (B') of amorphism nature was used as the heat-sealing layer, and extrusion membrane formation of a base material layer (80 micrometers) and the laminating sheet with a thickness [ of a heat-sealing layer (60 micrometers) configuration ] of 140 micrometers was carried out using the co-extrusion machine (the Tanabe plastics company make). next, the 35-micrometer oriented film was produced by the single-engined biaxial drawing machine (the Iwamoto factory company make) for the extension temperature of 70 degrees C, and preheating-time 5 minutes on condition that the part [ for /], and 100% draw magnification 2 of extension rates x2(vertical x width): side scale factor 4. On both sides of the film, it fixed to the frame after that, and the heat set for 20 seconds was performed in 100-degree C air oven. As for this laminating and oriented film, the white deposit was seen on the film front face (both sides) after extension and in two days.

[0196]

[Table 6]

比較例			4	5	6
乳酸系ポリ エステル組成 物(A)	乳酸系ポリエステル(A1)		1	1	—
	ポリ乳酸 100 部に対する乳酸系ポリエステル(A1)の添 加量(部)		10	10	—
	ポリ乳酸		P1	P1	—
	乳酸系ポリマー(A)の融点[℃]		175	175	—
	乳酸系ポリマー(A)の結晶化温度[℃]		110	110	—
酸系ポリエス テル組成物 (B)	乳酸系ポリエステル(B1)		1	—	1
	ポリ乳酸 100 部に対する 乳酸系ポリエステル(B1)の添加量(部)		10	—	10
	ポリ乳酸		P2	—	P2
	乳酸系ポリマー(B)の軟化温度[℃]		51	—	52
積層フィ ルム、又は 単層フィ ルム	厚み[μ m]		50	35	35
	ヘイズ値[%]		7	7	3
	耐熱性	6 0℃	○	○	○
		8 0℃	○	○	○
	E' [MPa]		0	0	0
	生分解性		○	○	○
	シール強度 [N/15mm]	8 0℃	3	0	—
		9 0℃	7	0	—
		1 0 0℃	8	0	—
		1 2 0℃	9	0	—
		1 4 0℃	9	0	—
	ブリード開始日数		1 年 以上	1 年 以上	1 年 以上

[0197]

[Effect of the Invention] This invention can offer the heat-sealing film which consists of the oriented film or sheet which presents the heat-sealing film which consists of the non-oriented film or sheet which has the outstanding shock resistance and flexibility, thermal resistance and seal reinforcement, the heat-sealing film that has low bleed out nature, the especially excellent impact strength, flexibility, thermal

resistance, and seal reinforcement, the thermal resistance excellent in the list and seal reinforcement, and low bleed out nature.

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[Translation done.]